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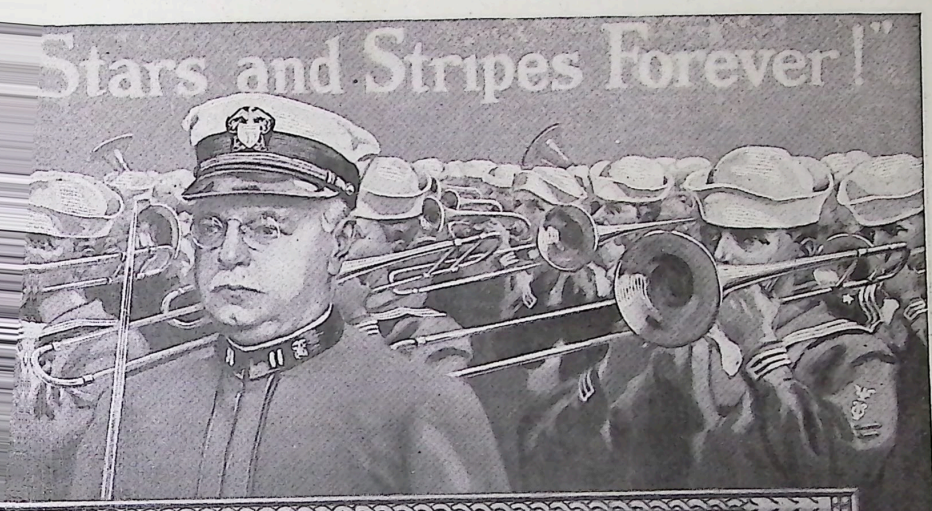

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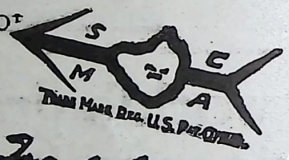

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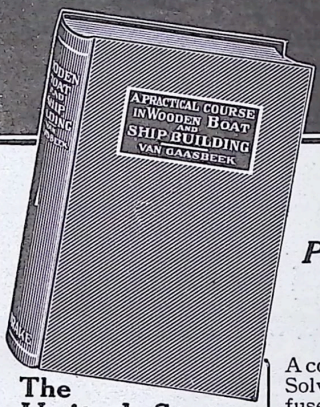

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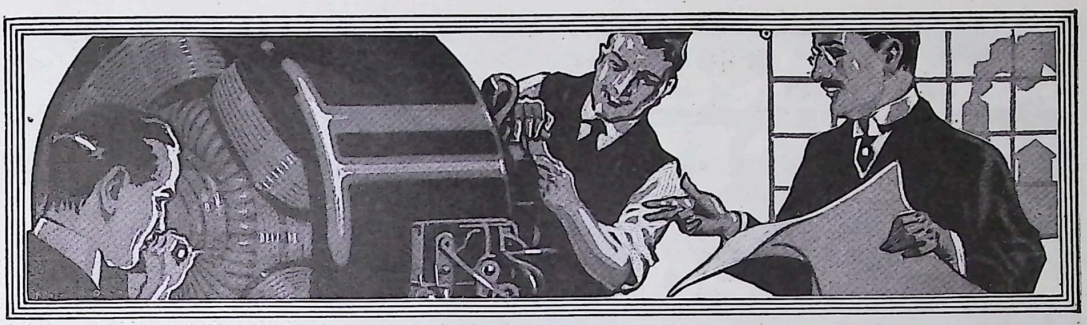

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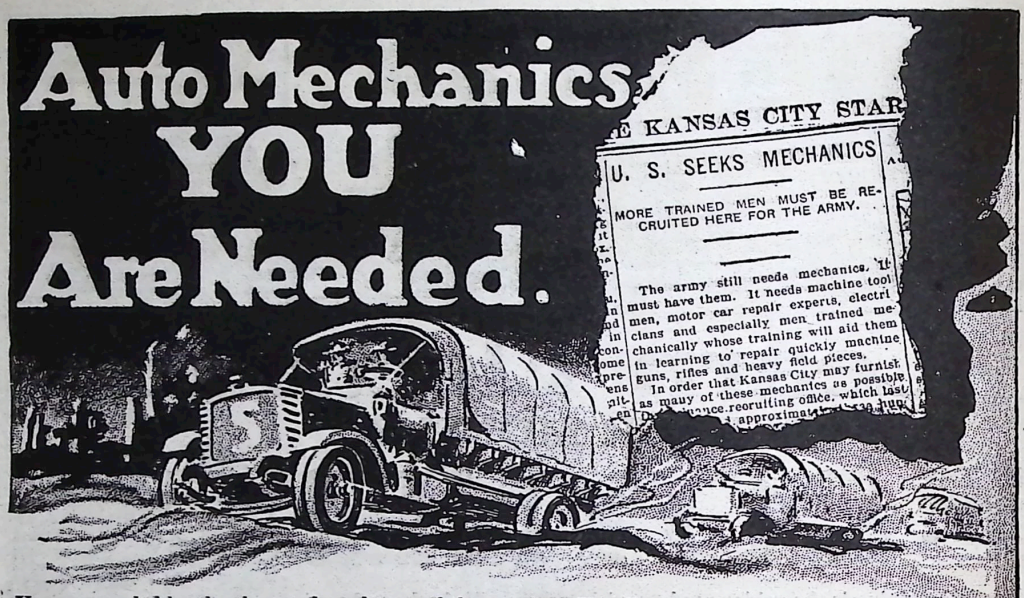

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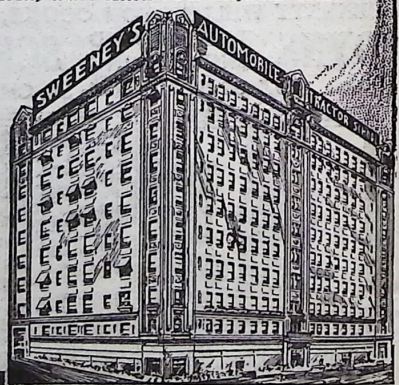

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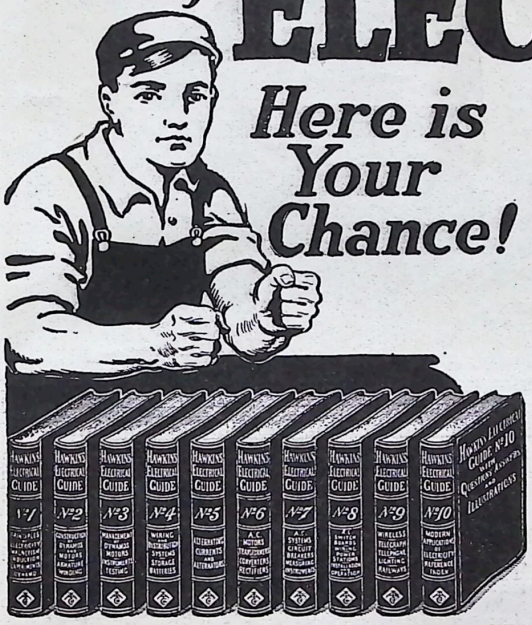

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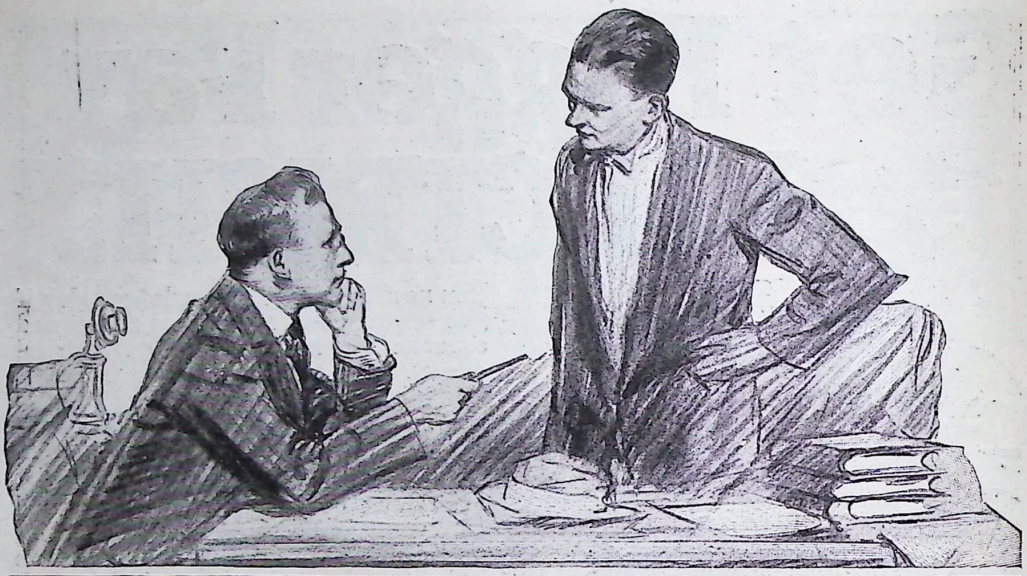

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- ☐ Marine Engineer
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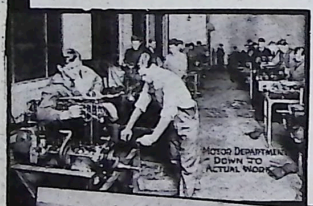

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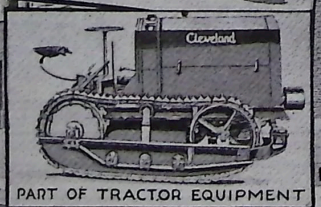

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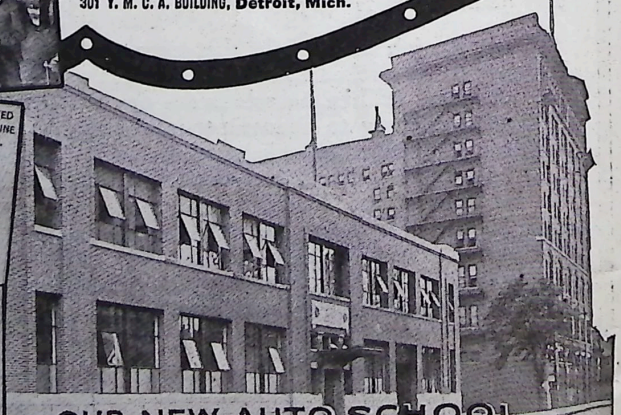

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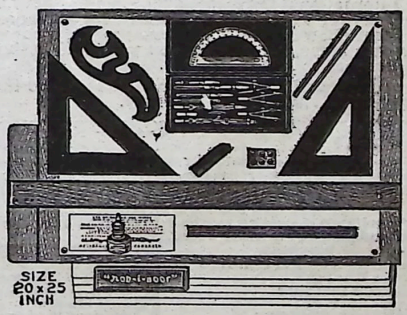

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Mechanical Draftsman	ILLUSTRATING
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Concrete Builder	Railway Mail Clerk
Structural Engineer	AUTOMOBILE OPERATING
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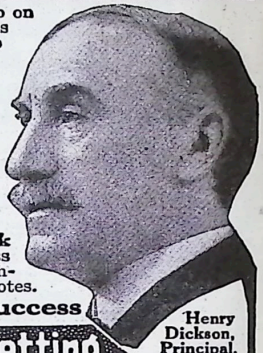
A 'Steel Trap' Memory



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EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours, will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

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AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 12c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

AGENTS—A New One! Harper's Fibre Broom and Ten-Use Brush Set combined. Saves broom expense; lightens housework; easy seller; first order returnable. Harper Brush Works, Dept. X, Fairfield, Ia.

AGENTS sell Reliable Custom-Made Raincoats and Gabardines. Big commission. Complete sample line free. Temple Raincoat Company, Templeton, Mass.

WANTED—New Ideas. Write for list of Patent Buyers and Inventions Wanted. $1,000,000 in prizes offered for inventions. Our Four Books sent free upon request. Victor J. Evans & Co., 163 Ninth, Washington, D. C.

AGENTS: Our new inventions will earn you steady income. Canvassers, County Rights Salesmen and Promoters write Fisher Mfg. Co., 2061G Railway Exchange, St. Louis, Mo.

NINETY Per Cent of Your Calls Turned into Sales! Wonderful Enthusiasm Follows Every Demonstration! Write at Once for Full Particulars of Our Line of Eradium (Luminous) Articles. Startling! Mysterious! Everlasting! Novel! They Shine in the dark. Crucifixes, House Numbers, Bulbs, Match Boxes, Pictures, Switch Plates. Sole Manufacturers. The Pioneer Corporation, 1259 W. 63rd, Chicago.

PATENTS That Protect. Write for free books. Highest references. Best results. Watson E. Coleman, Patent Lawyer, Washington, D. C.

INSYDE Tyres, inner armor for Automobile tires double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P, Cincinnati, O.

DON'T Wash your automobile. Dri-Kleanit does the job without water. Wonderful demand. Big profits. Details free. Dri-Kleanit Co., Dept. P., Cincinnati, O.

$50 WEEKLY and up selling Mexican Diamonds. Exactly resemble genuine; Same Rainbow Fire; Stand tests; sell at sight; Repeat orders. Write quick for Sample Case offer free. Mexican Diamond Importing Co., S. W. Las Cruces, New Mexico.

MAKE and Sell Your Own Goods. Machinery unnecessary. Expert Chemists advise. Special attention to beginners. Write for Formula Catalog. Blake Mystic Company, Washington, D. C.

AGENTS, $50 a week. Will show you how. Genuine Gold Leaf Window Letters. Chicago Agency Co., 842 Altgeld St., Chicago.

AGENTS — Ho-Ro-Co Skin Soap and Toilet Goods plan beats everything for agents' profits. "Ho-Ro-Co.," 112 Locust St., St. Louis, Mo.

PORTRAIT Agents, new and old, write us. We know what you want and need. Established 17 years. Pioneer, 1252 W. 63rd St., Chicago.

CALIFORNIA Flower Bead Necklaces beat anything for quick sales and profits. Absolutely new. Write for agent's proposition. Mission, 2819 PM, West Pico, Los Angeles, Calif.

AGENTS—If you are earning less than $200 a month, our Sentinel Burglar Alarm proposition for windows and doors will interest you. Many agents earn $15 daily. Both brand new inventions. No competition. Sells on sight to homes, offices. Instantly attached to any door knob or window. No batteries, wires or nails. Handsomely nickel-plated. Provides cheap burglar insurance. Both are big money makers. Write today for liberal terms to agents. Marshall Dobbins & Co., Manufacturers, 1422 Marquette Bldg., Chicago.

MANUFACTURE Egg-O-Lene, the only Pure Food Egg-Substitute, in your own Home. Represents Eggs Ten Cents dozen. Make Big Money selling this and my other Household and Food Specialties through Agents. Full Particulars, Formula Lists, Valuable Information for Stamp. Miller, Chemist, Tampa, Florida.

YOU can be your own boss with our Key Check outfit. Good for $5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 15 cents. Pease Die Works, Dept. M., Winchester, N. H.

SIGN Letter Agents and Painters: 500% Profit Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metallic Letter Co., 404 N. Clark St., Chicago.

AGENTS wanted to sell Eggnit—a pure food substitute for eggs. Easy selling article—big profits—quick repeater. Stuart & Co., 16 Main St., Newark, N. Y.

HIGH GRADE SALESMEN

SUCCESSFUL Security Salesmen Earn More Money than professional men. Our co-operation insures your success. No trouble to secure audience with securities we offer. Only ambitious, capable men with executive ability wanted. This is opportunity for conscientious man to advance to position of District Manager. Applicants must be over 30 years old, willing to prove their worth for position by first operating as salesmen on strictly commission basis. We shall be pleased to hear from any man able to fill above requirements. I. D. Noll & Co., 44 Pine St., New York.

SALESMEN—Become independent — own your business, experience unnecessary—selling our $6,000 Accident, Death, $30.00 Accident, $25.00 Sick Weekly Benefits. $10.50 yearly, half amounts $5.50. Guaranteed steady income from renewals. $250,000 deposited Insurance Department. Registration Dept. P, Newark, N. J.

SPECIALTY Salesmen—Steadily decreasing supply with increasing demand makes your opportunity if you have sales ability. We guarantee immediate shipment. Roberts averaged $480 monthly first 15 mo. Gillett, M24 Carlin Bldg., Cleveland, Ohio.

LIVE-WIRES everywhere. War orders have created wonderful opportunities. Big commissions. Free outfit. Apply today. Allen Nursery Company, Rochester, N. Y.

SALESMEN—City or Traveling. Experience unnecessary. Send for list of openings and full particulars. Prepare in spare time to earn the big salaries—$2,500 to $10,000 a year. Employment service rendered Members. Address nearest office. Dept. 125-K, Natl. Salesmen's Tr. Ass'n, Chicago—San Francisco—New York.

SALESMEN—Acquainted with merchants. Large demand; liberal commission; pocket sample. Wirth Salesbook Co., Dept. P., Chicago.

SALESMEN—Get our new line of Patriotic Salesboards; something new; just out. Iowa Novelty Company, Broadway and Fulton Sts., Keota, Iowa.

SALESMEN to wholesale or retail our automatic vaporizer. Men making thirty dollars a day as sideline; guaranteed to clean any car of carbon. Write or call, Miller Gas Saver Co., 320 South 6th St., Minneapolis, Minnesota.

SALESMEN for Roofing Paints and Cements. Experience not essential. Commission or salary. Full or part time. Murphy & Lange, Cleveland, O.

REPRESENTATIVE Wanted — We want an aggressive man to devote whole or part time on substantial, dignified, high-class proposition. Every steam plant a prospect. Every order means a repeat. Address Dept. H, 1750 Monadnock Blk., Chicago.

NEW Ford Krank-Kontrol Just Out. No more broken arms; no more doctor bills. Just what every Ford Owner has been waiting for. Backfire instantly releases crank—Can't Kick Back. Readily installed by anyone in five minutes. Exclusive Distributors wanted in every State and County. Motor Accessories Mfg. Co., 962 McKnight Building, Minneapolis, Minn.

SALESMEN—Motor Vim, the new power product which has startled motordom, is sold under a positive money-back guarantee of 50% more mileage; easier running, more powerful motor, with no carbon. Indorsed everywhere. Introductory offer $1.00 can free to car owners who will make personal test. Liberal sales contract to special representatives. Motor Products Co., 690 E. 71st, Chicago, Ill.

PERMANENT Income from Reorders on new mailing envelope. Exclusive territory. Pocket samples. Commission basis. American Stationery Company, 121 North Green Street, Chicago.

FASTEST Selling Advertising Specialty Made. Your customers—why not sell them. Best side line yet. Look us up, then write C. E. Erickson & Co., Des Moines, Iowa.

SELL to stationers, schools. Whirlwind seller. Mohler, Box 453, Chicago.

SALESMEN: Wonderful New Pearl Painting entitled U. S. Star of Liberty. Appeals to every one. Every home a prospect. $12.00 a day. Write quick for territory. Culver Art Co., B-8, Westerville, Ohio.

WERE You Ever Offered a Grocery Store? Our Proposition is Better. Let us tell you how you can handle Flour, Canned Goods, Provisions, an entire line of groceries, as well as Paints, Roofings, Stock Foods, Automobile and Machinery, Oils and Greases. No rent to pay. No investment in stock. Large orders taken from samples. Goods of guaranteed and proven quality. Selling experience not necessary. Very profitable work for "workers." Address Hitchcock Hill Co., Dept. 200, Chicago, Ill. Reference: Any bank or express company.

SALESMEN—We Will Pay You Well. Hardenburg's famous line of leather goods, diaries, calendars, and other advertising specialties; product of forty years' experience; easy sales, satisfied customers, repeat orders, big commissions; a serious offer for hustling salesmen; no canvassers. Write today. H. B. Hardenburg & Co., 73 Washington St., Brooklyn, New York.

SALESMEN! Tremendous War-Time demand. Wonderful New Adding Machine. Does work of $300 machine. Retails $10. Adds, Subtracts, Multiplies, Divides, automatically. Whirlwind in speed. Five-year Guarantee. Amazing profits. Full time or sideline. Calculator Corporation, Dept. P, Grand Rapids, Michigan.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money. Absolutely new. Big profits. Catalog free. Mission Bead Company, SP2819 West Pico, Los Angeles.

WANTED — Representatives everywhere, Exclusive territory. Gold sign letters for stores and office windows. Any one can put on. Write today for free sample. Metallic Letter Co., 403 N. Clark St., Chicago.

SALESMEN and District Organizers with Ford Cars to sell Simplex Ford Starter, the only mechanical starter with a reputation for making good. More than 16,000 in use. Fits any Ford car. Sells for $12.50. Write for agency. Box 443, Simplex Mfg. Co., Anderson, Ind.

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CLEVELAND corporation desires services of moving picture machine designer and mechanic. Want man thoroughly experienced in design of moving picture cameras, projectors and perforating machines. Write giving complete information regarding your experience, references, names of last three employers, age and state salary expected. Excellent opening for right man. All information will be held strictly confidential. Address Box 172, Cleveland, Ohio.

WANTED Men. Become Expert Chauffeurs, Auto Repairmen. Sample lessons free. Franklin Institute, Dept. S 818, Rochester, New York.

CASH for butterflies, insects. Send 3c stamp for folders. Sinclair, Los Angeles, California.

MEN wanted to make Toy Soldiers, Army, Navy and other toys. Homeworkers on small scale; Manufacturers on large scale. Greatest chance for industrious people for independent business. Enormous demand in American Made Toys. War stopped all importation. We buy these goods all year, whole output or surplus over sales, for three years, paying fixed prices. Hundred and more made complete per hour. Anyone can turn out perfect work without experience or additional tools. Castingform outfits $2.75 up. Booklet and information free. Toy Soldier Manufacturing Company, 32 Union Square, New York.

FIREMEN, Brakemen, Baggagemen, 8 hours, $140. Colored Porters wanted everywhere. Experience unnecessary. 810 Ry. Bureau, East St. Louis, Ill.

PHOTOPLAYS in demand. Make extra money. We show you how. Details free. Rex Publishers, Box 175, H-29, Chicago.

GOVERNMENT pays $900 to $1,800 yearly. Prepare for coming "exams" under former Civil Service Examiner. New Book Free. Write Patterson Civil Service School, Box 3020, Rochester, N. Y.

INVENT Something. Your ideas may bring wealth. Send Postal for Free book. Tells what to invent and how to obtain a patent through our credit system. Talbert & Talbert, 4102 Talbert Building, Washington, D. C.

THOUSANDS men—women 18 or over wanted. Government war positions. $100 month. List free. Write immediately. Franklin Institute, Dept. S-21, Rochester, New York.

U. S. GOVERNMENT wants thousands men—women—girls. $100 month. Easy work. List positions free. Franklin Institute, Dept. S-21, Rochester, N. Y.

MEN and Women Wanted, 18 to 60, to fill thousands of vacancies and new positions in Government Service in Washington and elsewhere. Permanent, higher salaries, patriotic work, easy hours, paid vacations. Quick appointments. Write for free Book 126, listing positions. Washington Civil Service School, 2026 Marden Bldg., Washington, D. C.

BIG pay for men and women as Draftsmen. $100 to $200 a month. Tremendous demand. Learn at home. We will help you secure position. Free book. Columbia School of Drafting, 754 McLachlen Building, Washington, D. C.

WANTED Immediately—U. S. Government wants thousands men—women, 18 or over for war positions. Easy clerical work. $100 month. List positions open free. Write immediately. Franklin Institute, Dept. S-21, Rochester, N. Y.

FIRST-CLASS Tool-Makers — We have openings for first-class toolmakers; permanent employment in live New England town of 14,000 population where living conditions are unexcelled. We are able to furnish desirable boarding and rooming places at reasonable rates; first-class wages quoted upon application. Call or write to J. T. Seller, Greenfield Tap and Die Corporation, Greenfield, Mass.

RAILROAD Traffic Inspectors Wanted. $125 a month and expenses to start; short hours; travel; three months' home study under guarantee; we get you position. No age limit. Ask for booklet L-4. Frontier Prep. School, Buffalo, N. Y.

GOVERNMENT Examinations. Most thorough preparation, $5; returned if not appointed; particulars free. American Civil Service School, Washington, D. C.

MAKE money writing Photo-plays; details free to beginners. No correspondence course. Producers' League, 230 Wainwright, St. Louis.

BE a Mirror Expert. Good income; spare time home at first; no capital; we train, start you making and silvering mirrors; French method. Free prospectus. W. P. Derr, Pres., 579 Decatur, Brooklyn, N. Y.

WANTED—An Idea! Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write for "Needed Inventions" and "How to Get Your Patent and Your Money." Randolph & Co., Patent Attorneys, 620 F Street, Washington, D. C.

SITUATIONS WANTED

WANTED: A position as airplane mechanic helper. Frank Foreman, Okla City, Okla.

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KEROSENE Burner for Cook Stove—must be cheap and absolute perfect. Post Office Box 758. W. R. Harwell, Birmingham, Ala.

WANTED—Correspondence course, mail-order business, goods that sell. Mohler, Box 453, Chicago.

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PIANOS, Phonographs. New and used. Wholesale Prices. Guy Hallock, Duluth, Minnesota.

FOR Sale—2,000 canvas cots, $1.75 each. 300 tents, all sizes, used one week. D. M. Kerr Mfg. Co., 1007 Madison St., Chicago.

CHOICE Silver Black breeding Foxes. Reid Bros., Bothwell, Ontario, Canada.

BE a Manufacturer! Buy and market a practical invention and make money. Write Fisher Mfg. Co., 2061B Railway Exchange, St. Louis, Mo.

UNIVERSAL Knitting Machines. Many styles, hand or power. For Catalogue, address, Daniel Bueker, Peabody, Mass.

GUNS, SPORTING GOODS, ETC.

BUY, sell, exchange old-time and modern Fire-arms. Antiques wanted. Stephen Van Rensselaer, 805 Madison Avenue, New York.

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SPECIAL bargains in second hand Attrition mills, burr mills, crushers, corn shellers, bran dusters, dust collectors, purifiers, reels, double, single, 2 and 3-pair high roller mills, sieve bolters, receiving separators, scourers, etc. Write for description and prices. Sprout, Waldron & Co., P. O. Box 429, Muncy, Pa.

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GUARANTEED alternating current, single phase, rebuilt motor bargains. Prices from $7.00 to $120.00. General Electric, Emerson, Westinghouse, Wagner. Many other bargains, including direct current and 3 phase. Motors bought, repaired, exchanged. Tell us your needs. Write for catalog supplies and motors. Hyre Electric Co., 633-EH, South Dearborn St., Chicago.

500 SMALL Electric Motors, 110 Volts AC, ¼-HP, $16.50. Large quantity ½-HP, $33. Vacuum Cleaners, Irons, etc. Everything brand new. Never unpacked. Guaranteed perfect. Priced lower than manufacturer's cost. Send for Money-Saving List. Lincoln Supply Co., Ephrata, Penn.

HAVE no further use for and will sell at low price one 100 H. P. 11x12 Westinghouse gas engine; direct connected to a 62½ kilowatt, 3 wire generator including switchboard; transformers, and all other equipment. We guarantee the entire outfit to be in first class condition, and practically as good as new, or can be seen in operation any time at our plant. Maremont Mfg. Co., 916-918 So. Wabash Ave., Chicago.

30-h.p. FOOS Gas Engine. New piston, new cylinder, in perfect working condition. Stewart Elevator Co., Tab, Ind., RFD No. 1.

2 h.p. STATIONARY engine, $29. New Goulds water pump, $40. Lawn Mower grinder, $12. Hux, 68 Prospect St., Torrington, Conn.

WE sell Blue-Prints, Castings, complete Steam and Gas Engines. ⅛ H. P. up. Particulars for stamp. M. M. Eng. Co., 364 Monadnock Blk., Chicago.

SMALL motors and generators, ¼ HP. A. C. motors $17.50, ¾ H. P. $35. Battery charging sets, 100 new machines $30 each and up. Charging, Lighting and Moving Picture Arc Generators, $10 and up. A. C. motors, 1 and 3 phase for immediate delivery. All material guaranteed. Less than half price. Write for new bulletin. Johnston, West End, Pittsburgh, Pa.

ENGINE User Agents Wanted to use, demonstrate and sell "Big Ben," wonderful new 2½ H. P. gasoline engine. Free introductory offer and free details. C. Benninghofen & Sons, Dept. P, Hamilton, Ohio.

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REFLUE your boiler with secondhand tubes. Save big money. Ship anywhere. Harris Machinery Company, Minneapolis, Minnesota.

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WANTED, small screw-cutting lathe; Compound rest. "Star" preferred. Give price, age and condition. C. E. Anderson, 1614 South 15th Ave., Maywood, Ill.

GASOLINE Engines, ¼ horsepower, complete, $22; bare, $15. Mustin Mfg. Co., Newport, Kentucky.

"RED Devil" Glass Cutter; cuts any thickness, saves labor, time, money. Saves the hands. Style 024, 15c. Glaziers' Booklet free. Smith & Hemenway Co., 97B Coit Street, Irvington, N. J.

ONE Big Four, oil-burner and electric lights, four cylinder tractor. Horse power 20-35. Five breaking plows with extra bottoms that have never been used. One 10 foot, double-disc harrow, with seeder attachment. One 10 foot steel harrow. Two sets steel wheeled trucks, capacity 10,000 lbs., for trailers. This lot of machinery was bought new of the Emerson-Brantingham Implement Company of Rockford, last season, and is practically like new. Price, $2,000. N. L. Jackson, Belvidere, Ill.

ENGINE Lathe, swings 9½ in., takes 25 in. between centers. Complete set gears cutting all size threads 3 in. to 40 in., $63.50. Grammes & Sons, Allentown, Pa.

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PATENTS Wanted. Write for list of Patent Buyers who wish to purchase patents and What to Invent with List of Inventions Wanted. $1,000,000 in prizes offered for inventions. Send Sketch for free opinion as to patentability. Write for our four Guide books sent free upon request. Patents advertised Free. We assist inventors to sell their inventions. Victor J. Evans & Co., 184 Ninth, Washington, D. C.

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STAMPS sent on approval at 70% discount. Reference required. Emory Renoll, Hanover, Pa.

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QUALITY Packet, $2.50 catalog value, all different, 75c. I buy stamps. J. W. Trevor, 9 North Park St., Halifax, Nova Scotia.

STAMPS! Confederate and Confederation, Free! (Reference.) Southern Stamp Co., Pyatt, Ark.

25c PAID for one kind 1916 used envelopes. Particulars 3c. Stamp Exchange, Bryn Mawr, Wash.

"QUALITYPLUS" Approvals, try them. McAndrews Stamp Co., Charleston, W. Va.

20 UNUSED stamps free. All different. Postage, 3c. Fisk Stamps, Toledo, Ohio.

PACKET of 23 stamps; no two countries alike, Packet hinges. Set of $1 and $2 U. S. Rev., all for 5c. Mention paper. Miami Stamp Co., Toledo, Ohio.

105 CHINA, etc., stamp dictionary, list, 2c. Album (500 illustrations) 3c. Bullard, Sta. A., Boston.

STAMPS—12 different from warring nations, 10c; 10 different foreign coins, 15c; 20 Sweden stamps, 10c. Lists free. Toledo Stamp Co., Toledo, Ohio.

24 VARIETIES Cuban stamps, 10 cents. List of 6,000 low-priced stamps free. Chambers Stamp Co., 111 P. Nassau St., New York City.

STAMPS—338 fine foreign, incl. Mex. War, Salvador, incl. Officials, Guatemala, China, etc., only 10c. Best App. Sheets 60 to 80% dis. 100 diff. fine 10c. 1,000 hinges 10c. Big 120-page catal. free. We Buy Stamps. Hussman Stamp Co., St. Louis, Mo.

STAMPS, 61, all different, free. Postage, 3c. Mention paper. Quaker Stamp Co., Toledo, Ohio.

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SAVE all odd-looking money and bills and send 4c for Large Illustrated Coin Circular. It may mean much profit to you. We pay cash for all rare coins and bills. Send now. Numismatic Bank, Dept. H, Fort Worth, Texas.

CALIFORNIA Gold. Quarter size, 27c; half-dollar size, 53c; dollar size, $1.10. Large cent 1817 and new catalogue 10c. Norman Shultz, King City, Mo.

OLD Coins, Large Spring Coin Catalogue of Coins for Sale, free. Catalogue quoting prices paid for coins, ten cents. William Hesslein, 101 Tremont St., Dept. M, Boston, Mass.

$4.25 EACH paid for U. S. Flying Eagle cents, dated 1856. We pay cash premiums on hundreds of old coins. Send 10 cents for New Illustrated Coin Value Book, 4x6. Get posted. It may mean your fortune. Clarke Coin Co., Box 15, Le Roy, N. Y.

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TRICKS, Puzzles, Jokes, Magical Apparatus, Plays, Stage Supplies, Mindreading Acts, Sensational Escapes, and Illusions. Free large illustrated 1918 catalog. Oaks Magical Co., Dept. 541, Oshkosh, Wis.

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WONDERFUL, Mystifying, Dancing Skeleton. Biggest novelty out. Silver dime. Gross, 20 Kenilworth. Malden, Mass.

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DON'T grow old young. Anyone can easily use this rapid method at home. Prostate disorders are positively treated with permanent results, without drugs, massage, diet, or inconvenience. A high-grade scientific means backed by the experience of a multitude of grateful patrons. In use among the best physicians, osteopaths, chiropractors, physical culturists and others. No risk, sent on approval on a money-back basis. A private, effective home treatment. Write frankly in confidence. The Electrothermal Company, Anthony Bldg., Steubenville, Ohio.

SHAVE-E-Z! Joyfully! Always! Write Shinestrop, 230B East 50th Street, New York.

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PAGE 115 Will Startle You! Turn to it at once. One of that page's offers is a genuine $5.00 luminous dial Leonard Wrist Watch (Guaranteed for One Year), with Kitchener Wrist Strap, for $3.98! Get the book that is featured on that page. It's Free. And that book lays before you the greatest money-saving opportunities in watches and jewelry that you ever heard about. War times give us the chance to buy diamonds and other jewelry at a fraction of their true value. We share our savings with you. Write right now for this book and Special Watch and Jewelry bargains. David Stern Company, 818 Davsco Bldg., 1027-29 Madison St., Chicago.

HIGHEST prices paid for diamonds, platinum and old gold. Ira Van, 3148 State St., Chicago.

GENUINE Pearls cheap by Pearl Fisher. Particulars for stamp. Address Pearls, c/o R. Jeagerman, 5815 Easton Ave., St. Louis, Mo.

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WE pay cash for used Phonograph Records—Victor, Columbia, etc. Uni Co., 113 No. 9th St., Philadelphia, Pa.

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BUILD Your Phonograph. "Perfection" high quality spring and electric Motors, Tone Arms, Reproducers. Wonderful results, big saving. Handsome new catalog free. Indiana Phonograph Supply, Indianapolis, Ind.

BUILD Your Own Phonograph. Big saving. Pleasant instructive work. Complete instructions, blue-prints, etc., absolutely free. Write today. Associated Phonograph Co., Dept. P, Cincinnati, Ohio.

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STARTLING Values in Typewriters. $10 to $15 up. Factory rebuilt. All makes. Shipped on trial. Write for our special offer No. 126-V. Whitehead Typewriter Co., 186 North La Salle St., Chicago.

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LARGEST Stock of Typewriters in America. Underwoods way under manufacturer's prices; rented anywhere, applying rent on purchase price. Free trial. Installment payments if desired. Write for catalogue 70. Typewriter Emporium, estab. 1892, 34-36 W. Lake St., Chicago, Illinois.

UNDERWOODS, Olivers, Remingtons, $15 to $45; terms to suit; free trial. Typewriter Co., 193 N. Dearborn, Chicago.

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WONDERFUL Adding Machine, seven columns capacity, only one dollar. Adds and multiplies as fast as the fingers will move. Thousands being sold through demonstration. L. J. Leishman Co., Dept. Q, Ogden, Utah.

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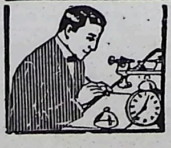

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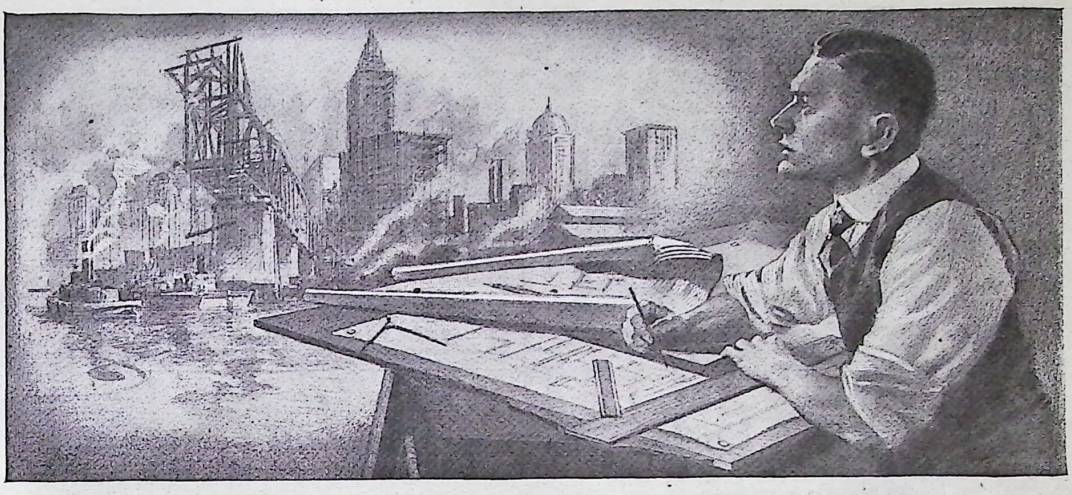

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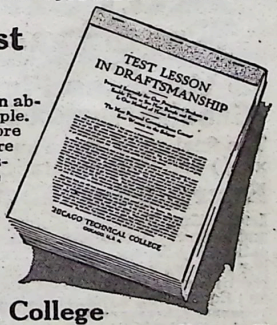

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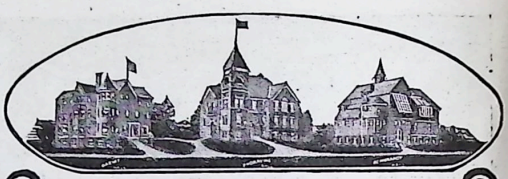

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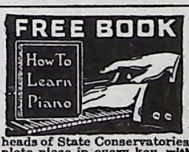

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Young Men Who Registered June 5th

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Parents, Train Your Sons

Give your sons this training so that they can fill the places of the mechanics who have already left the factories. As trained mechanics they serve their country best, and certainly are equipped for a money-making business after the war.

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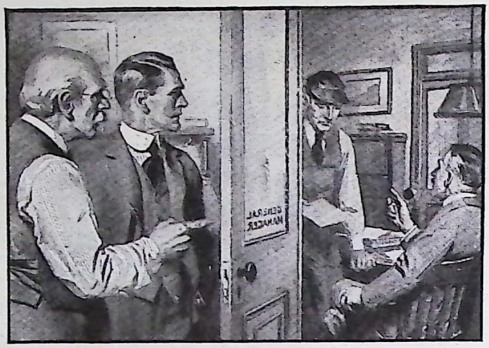

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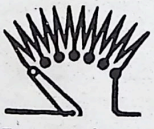

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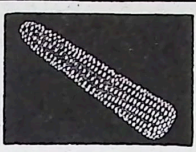

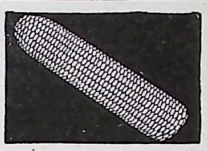

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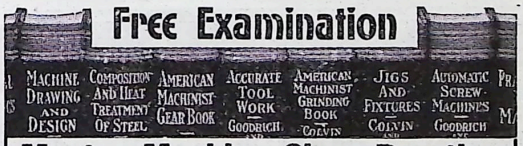

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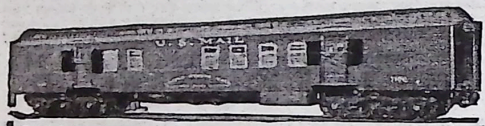

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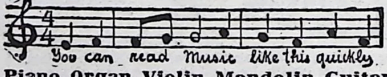

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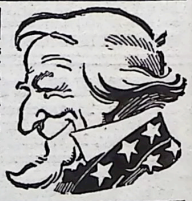

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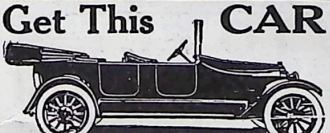

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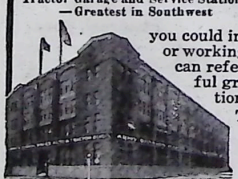

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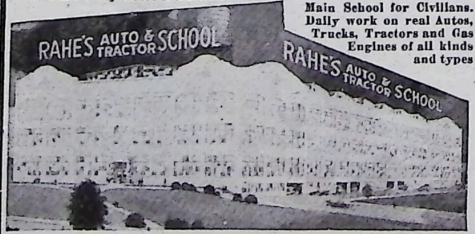

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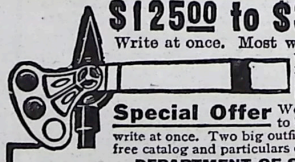

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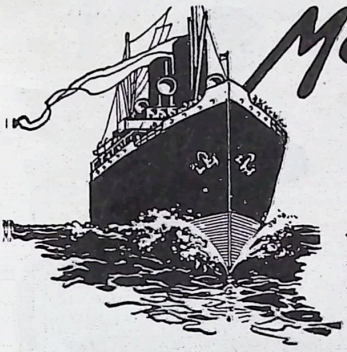

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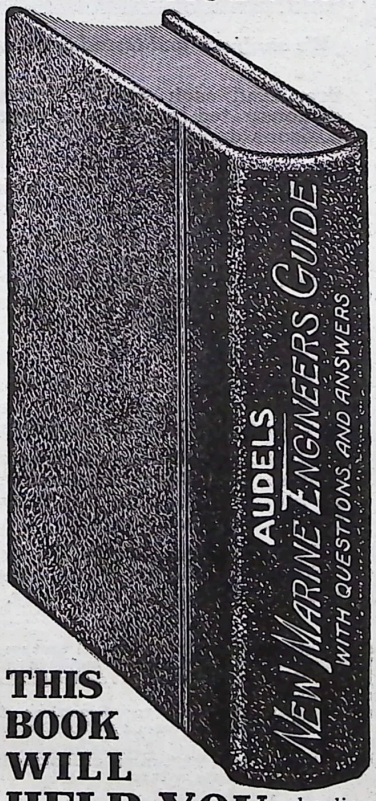

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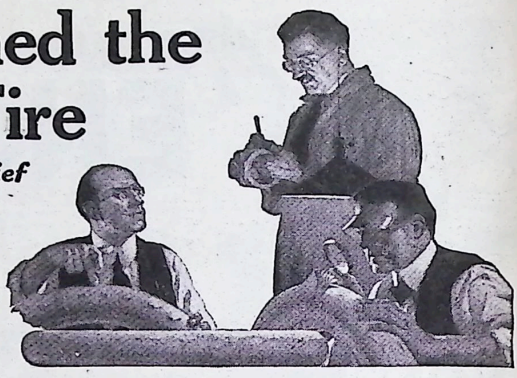
As told by our factory chief



We analyzed and tested over two hundred tires

THE story of the Brunswick Tire is one which all of us will ever be proud to tell.

The world-famed House of Brunswick, in 1915, decided to apply the Brunswick principles to tires.

In other lines they had always built the finest thing produced. To everyone and everywhere Brunswick means perfection. To stake that prestige on a tire was a momentous step.

First they gathered together a brilliant staff. Not an expert among them had spent less than 20 years in tire making.

Each was a master of this craft. And each, above all, believed in maximum standards. All realized that success must come by building better tires than others. Men cannot be fooled on tires.

This entire staff spent two years in careful preparation. They built and equipped a model plant with every up-to-date facility.

In the meantime, over 200 types of high-grade tires were analyzed and tested. We proved to a certainty what was best in every varying detail.

Model tires were made up embodying all these known supremacies. They had the best treads in existence. The fabric met our highest tests.

They had all the reinforcements — all the extras — which actually improve a tire. And each was a known improvement, demonstrated by a 20-year experience, by comparisons and tests.

Then these model tires with their quantity costs were submitted to the Brunswick directors.

Sold at usual prices — as they are — the margin is extremely small. We pointed out a dozen ways of possible economy. But the Brunswick people — to a man — said, "Make those model tires."

And that is what we are doing.

There is no secret in an ideal tire. All formulas, all methods are well known. A perfect tire is simply a question of care and skill and cost.

Formulas, fabrics and standards vary vastly in cost. And they vary as much in endurance. Reinforcements, plies and thickness are a matter of expense.

In every tire factory the great question is, "How much can we give for the money?" And the tire depends on the policy.

The Brunswick idea is to give all that is possible—all that anyone gives—all that any cost can buy. Then they save in distributive methods through their nation-wide organization. The result has been an instant and sensational success. Never has a new tire met such a welcome.

If these ideals appeal to you we ask you to try these tires. They are sold on a 5000-mile adjustment basis. They are sold on our pledge that a better fabric tire is impossible.

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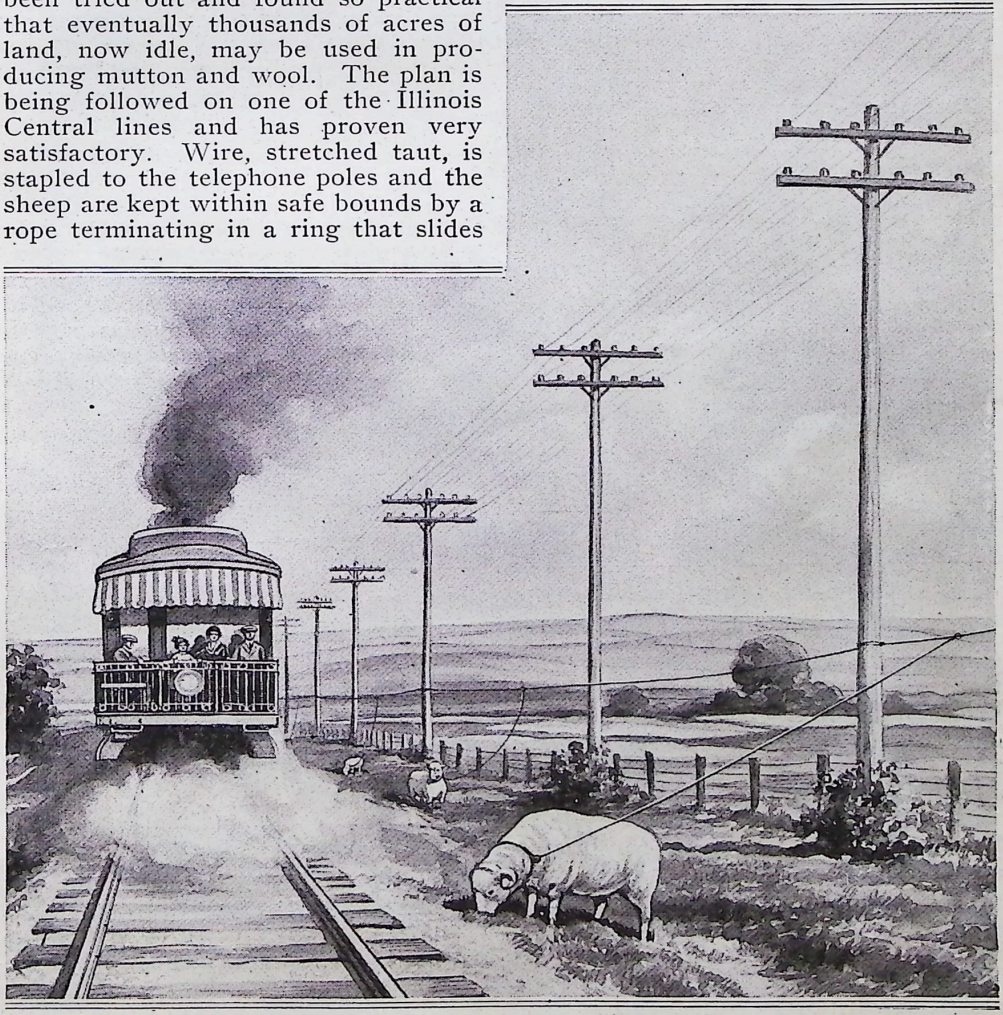
Vol. 30 AUGUST, 1918 No. 2

Tethered Sheep Graze near Railway Track

THE tethering of sheep with slip lines so that they can graze along railway rights of way without danger of being killed by passing trains, has been tried out and found so practical that eventually thousands of acres of land, now idle, may be used in producing mutton and wool. The plan is being followed on one of the Illinois Central lines and has proven very satisfactory. Wire, stretched taut, is stapled to the telephone poles and the sheep are kept within safe bounds by a rope terminating in a ring that slides on the wire. In Illinois the grass between two alternate poles in a right of way of the ordinary width has been found sufficient for one animal.



Utilizing the Railroad Right of Way for Sheep Grazing: By Tethering the Animals with Slip Lines, as Shown, They are Kept Out of Danger and at the Same Time can Feed on Land That has Lain Idle Heretofore. The Scheme has been Tried Out with Successful Results in Illinois

"GERMANIA" TRANSFORMED INTO "MISS COLUMBIA"

With the assistance of skillful, patriotic artists, a statue of "Germania," which has long occupied a niche in a Cincinnati business block, has been transformed into "Miss Columbia." One of the first steps in this novel change of character was to cut off Germania's head ruthlessly and substitute a head the face of which expressed good will instead of imperiousness. The Teutonic armor was also obliterated and an American eagle and flowing draperies were substituted. On the shield that once bore the German eagle now appears the Stars and Stripes, while on Columbia's head is an ornament set with stars. One part of the figure that was untouched was the outstretched arm.

On the Left Is "Germania" Who, Thanks to the Skill of Artists, was Decapitated, Reclothed, and "Reheaded." Right: Emerging from the Ordeal as "Miss Columbia"

NEED EMERGENCY DEVICES FOR STOPPING SHIPS

A notice recently issued by the British Board of Trade calls on all ship owners to provide special means for quickly stopping their vessels when torpedoed. This is urged because in many instances vessels have been so disabled by submarine missiles that it was impossible to stop the engines, and when attempts were made to launch the lifeboats they were capsized by the motion of the vessel. Some ships have been torpedoed or mined near the bow, causing the stern to project into the air, while the propellers continued to revolve partly above water. On more than one occasion this has caused destruction of lifeboats and loss of life. Ship owners are counseled to provide means for stopping the engines from the deck or the engine-room hatchway. It is also pointed out that the steam should be entirely shut off from the engines before abandoning the engine room, and every effort made to destroy the vacuum in the condensers, and so prevent, if possible, further movement of the propellers.

GROCERIES DELIVERED BY AEROPLANE

That grocery supplies may be brought to mechanicians at work in a new flying field, an aerial delivery line has been established between that point and a city 90 miles distant. The trips will be made daily as long as necessary.

HOSPITAL CEILING MOVIE SCREEN FOR WOUNDED

WOUNDED soldiers in American base hospitals in France are being entertained with moving pictures which, with the aid of portable projectors, are shown on the ceiling above their cots. By this ingenious utilization of waste space, a means has been found of cheering patients who are unable to sit up or be moved about. Those who have spent hours and weeks on their backs watching flies stroll around a bare ceiling are well able to imagine the pleasure that moving pictures afford bedridden soldiers.

CONCRETE FREIGHT CARS

War Emergency Inspires Radical Step in Construction of Railway Rolling Stock

By SEARLE HENDEE

IN a few weeks' time experiments will have determined the practicability of constructing railway freight cars of reinforced concrete. Stimulated by war conditions, which make the immediate provision of more carriers and the conservation of steel imperative, a prominent Chicago engineer, in association with some of the largest car-building companies, has turned his attention to the fabrication of concrete gondolas. A car is to be built at once in accordance with plans and specifications now in the final stage of completion. Contingent upon the showing made by this car, which is patented, is the immediate production of others on a wholesale scale.

The importance of the idea seems considerable at this time. Sheet steel, used in building all-metal gondolas, is needed for ships. Reinforcing steel, on the other hand, is plentiful. It is recognized as being next to impossible to build as many cars of steel as are needed. Composition cars—made partly of wood and partly of steel—are being produced, but this is not a wholly satisfactory solution of the problem for the reason that such cars have not the desired durability.

It remains to be seen what the new gondola will do. But it has been designed to accomplish the same work and withstand the same severe usage as modern steel cars. In addition to costing probably not more than half as much as one of steel, the concrete car is capable of being more quickly built. Furthermore its adoption would release many skilled workmen for shipbuilding.

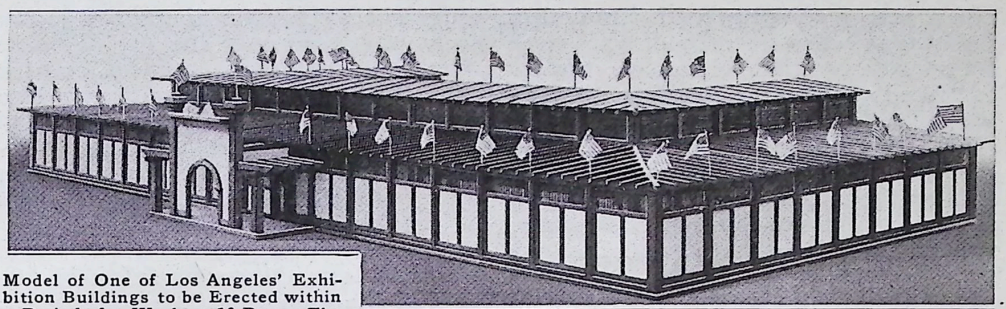
The question of practicability seems to be dependent on weight. Standard steel gondolas weigh from 38,000 to 52,000 lb. If it is found possible to construct a concrete car of 50 tons' capacity and consistently keep the weight at about 50,000 lb., engineers feel that success will be assured.

For the time being attention is concentrated on the gondola car. Plans, however, are already under way for the subsequent construction of other types of concrete freight carriers.

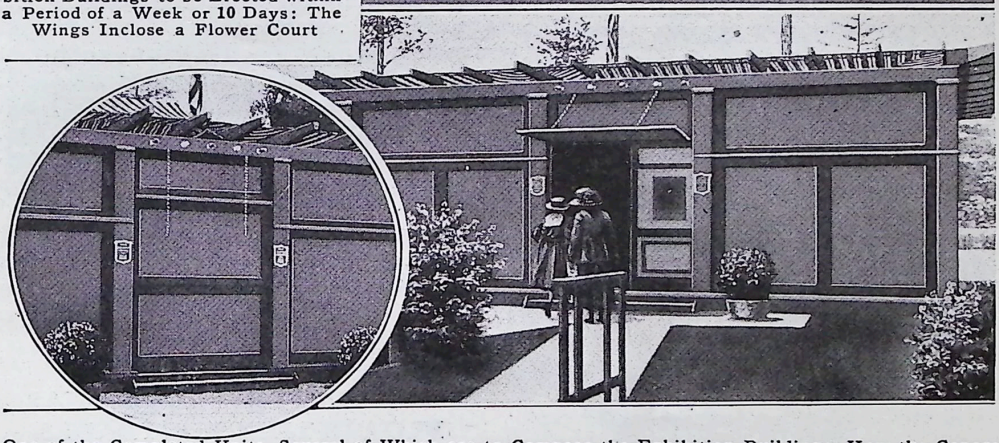
In this connection it is interesting to know that for two years or more certain companies have been employing concrete in repairing freight cars, and have found it satisfactory. For this purpose a fine cement mortar, sprayed by a cement gun, is used.

EXHIBITION BUILDINGS MADE IN SECTIONS

Because of the novel method of construction employed, contractors expect to erect two exhibition buildings in Los Angeles, each 160 ft. square, in a period of a week or 10 days. Just as bookcases are made in sections that can be added to as desired, these structures will be made of units similar to one another, each 20 ft. square, which can be assembled rapidly. The lumber is being cut and sorted in advance so that the actual task of erection will take a comparatively short time. A feature of each building will be a court filled with palms and flowers. Latticework in the upper part of the structures will afford ample ventilation, as well as light during the day. Elec-



Model of One of Los Angeles' Exhibition Buildings to be Erected within a Period of a Week or 10 Days: The Wings Inclose a Flower Court

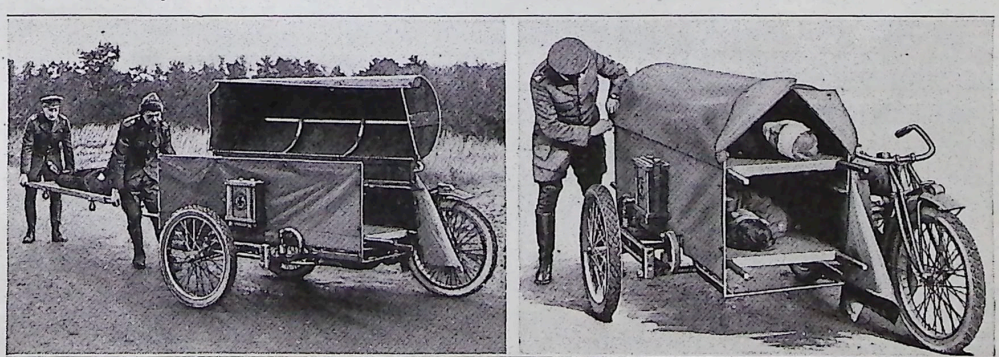


One of the Completed Units, Several of Which are to Compose the Exhibition Building: How the Canopy over the Door can be Let Down to Close the Entrance, is Shown in the Insert

tric light is provided for night use. When the two weeks' fair, for which these edifices are being planned, is finished they will be torn down and stored for similar occasions in the future or erected elsewhere. A centrally located feature of the completed building will be a high arched entrance flanked on either side by ornamental shelters.

MOTORCYCLE AMBULANCE HAS NEW FEATURES

A motorcycle ambulance capable of efficient service under most trying conditions has been built for use abroad, and embodies many new refinements of design. The sidecar will carry two disabled men on stretchers, one above the

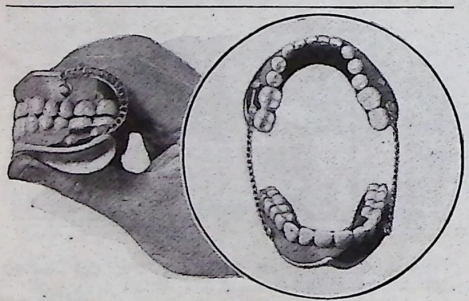


A New Motorcycle Ambulance for Carrying Two Patients Fully Protected against Dust and Weather: At the Left It is Shown Open, Ready to Receive a Wounded Soldier; at the Right the Top is Down and the End Curtains are being Attached

other, and is equipped with a rounded top, hinged to one side of the steel framework so that it can be turned back for loading and unloading. A canvas covering, which attaches to the sides, bowed top, and ends like a side curtain, affords complete protection against the weather for the men on the stretchers. Fastened to one side of the vehicle is an instrument and first-aid kit.

FALSE-TEETH SETS HELD IN PLACE BY SPRINGS

A new device has been invented to keep an upper and a lower set of false teeth in alinement without employing



Two Views of an Upper and Lower Set of False Teeth Fastened Together by Coil Springs Which Hold Them in Place in the Mouth

suction. It consists of a pair of flat coiled springs attached by pivots to the rear of the two plates. The springs are bowed, the bend extending toward the rear of the mouth, and cause the plates to exert a continuous pressure on the jaws, keeping them in position at all times.

MOTOR TRANSPORTS SURPASS ALPINE RAILWAY RECORD

When British and French troops were hastened to the assistance of the Italians during the disastrous Austro-German offensive in November, last year, motor transports made up for the inadequacy of the railway facilities. Until now the real importance of this fact has not been fully appreciated, because of incomplete information. For a period of several weeks, however, one long procession after another of motor convoys passed over the Alpine roads that Napoleon's legions trod a hundred years ago in making their way into Italy. Some of these trains traveled more than 1,000 miles, and it is therefore of interest to note the authoritative and significant statement that they were as regular in maintaining their schedules as the railways, and furthermore showed a lower percentage of accidents, despite the dangerous character of the roads at some points. All freight trucks were arranged in groups of about 20 machines, all of the same make, and placed in charge of an officer. Each vehicle carried fuel for a 250-mile run. Filling stations were provided at intervals along the route. The various groups had their own mechanics and were supplied with an adequate outfit of spare parts. A motor kitchen was also attached to each division, and a motor repair shop sent with each ten groups.

NEW LIFE PRESERVER HAS FLOATS LIKE FOOTBALLS

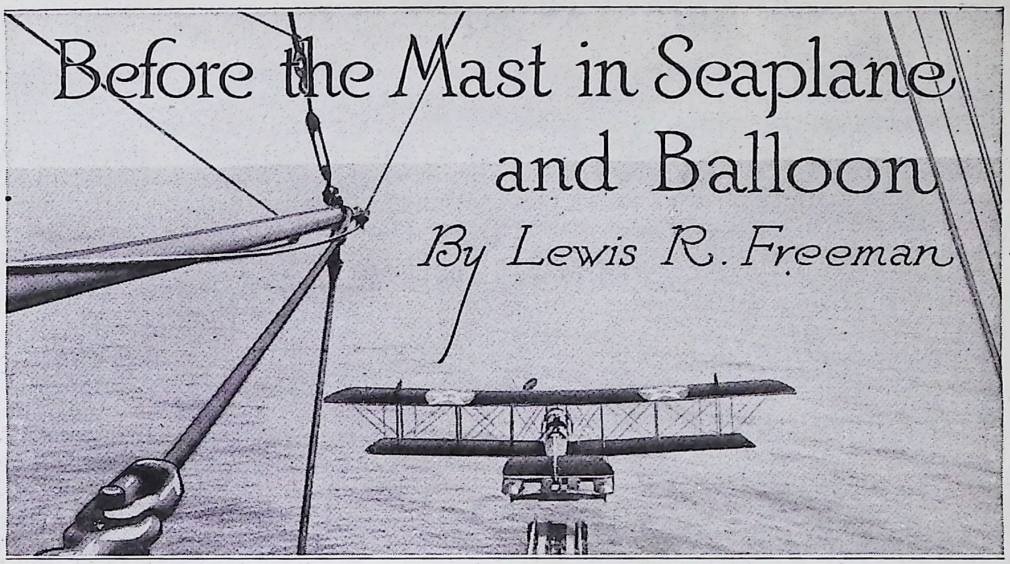
One of the newest types of live preservers consists of a belt to which are attached two or three inflatable units shaped like footballs. Each has a casing of properly reinforced duck, and is lined with a rubber bladder having a valve at one end for inflating it. The preserver weighs only about one and one-fourth pounds and when deflated can be carried in the pocket. Equipped with two bags, it has sufficient buoyancy for use in swimming, while the

A Man, Weighing 257 Pounds, Supported in the Water by a Life Preserver Having Three Floats Resembling Footballs

three-bag life preserver will sustain a person weighing 250 lb. in the water.

Before the Mast in Seaplane and Balloon

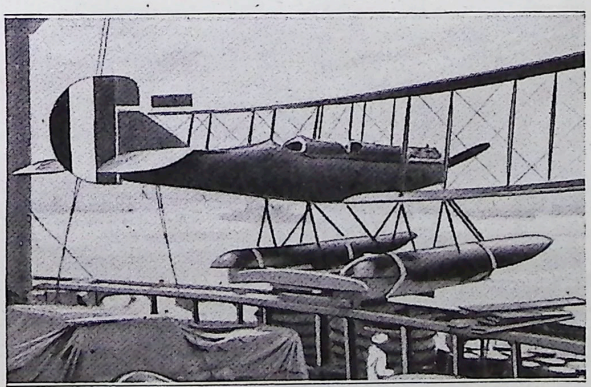
By Lewis R. Freeman



Going Up to Scout for Submarines in the War Zone: A Seaplane Taking to Its Wings. Great Care is Observed in Launching a Machine, For to Flounder over the Bow of a Moving Ship Is a Dangerous Mishap

The text of this article has been passed by the British Admiralty Censor.

I HAD crossed on the old "X——" in those ancient days when, as the latest-launched greyhound of the Cunard fleet, it held for a few precarious months the constantly shifting blue ribbon for the swiftest transatlantic passage; but in that angular "cubistic" lump of lead-gray, looming over the bow of my spray-smothered launch to blot out the undulant skyline of the nearest Orkney, there was not one familiar feature. Its forward funnel had been "kippered" down the middle to somewhere about the level of the lower deck, and carried up in two smaller stacks which rose abreast to port and starboard. This had been done (as I learned later) to make room for a platform leading forward from the waist over which seaplanes could be wheeled to the launching stage, which ran out over the bow from beneath the bridge. The break in the forecastle had been closed in connection with a sweeping alteration which had converted the whole forward end of the main deck into a roomy seaplane "repository," with space left for a repair shop.



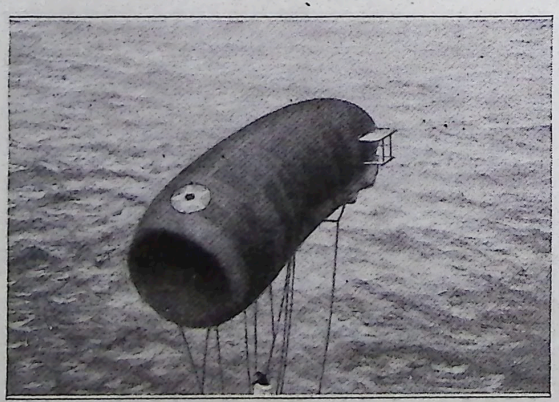
A Two-Seater Carried on Deck without being Dismantled: It must be Firmly Anchored, or Otherwise a Puff of Wind will Cause Trouble

The changes aft were no less startling. The old poop seemed to have been razed to clear the last 200 ft. of the main deck, and over the 10 or 15-ft.-high railing which surrounded this, the top of a partly inflated observation balloon showed like the back of a half-submerged turtle. The whole effect was weird and "impossible" in the extreme.

To one who has had experience only

of hangars on land, perhaps the most impressive thing about an "aeroship" is the amount of gear and equipment which can be stowed and handled in restricted spaces. Wings and rudders which fold and refold upon each other until they form compact bundles that can be trundled about by a man or two, collapsible fuselages and pontoons, wheels which detach at a touch of a lever, knockdown transmissions—these things were everywhere the rule. One "baby" scout I saw almost completely assembled on the launching stage, and the tail, which a couple of men wired to the main body in little more than a minute, I would have sworn I could have knocked off with a single well-placed kick. Yet, five minutes later, I saw that same machine loop, side-flop, double-bank, and (quite at the will of its young pilot, who is rated the most expert seaplane man in the naval air service) recover at the end of a 500-ft. rolling fall, all without apparently starting a strut or rivet. Collapsibility and portability are evidently secured without sacrificing any great amount of strength.

When a seaplane is about to be launched, after the usual preliminary tuning up on the launching stage, the ship is swung dead into the teeth of the wind and put at full speed. This matter of wind direction is very important, for its variation by a fraction of a point from head on may easily make a crooked run and a fluky launching. As the latter would almost inevitably mean that both plane and pilot must be churned under the swiftly advancing forefoot of the ship, no precautions calculated to avoid it are omitted.

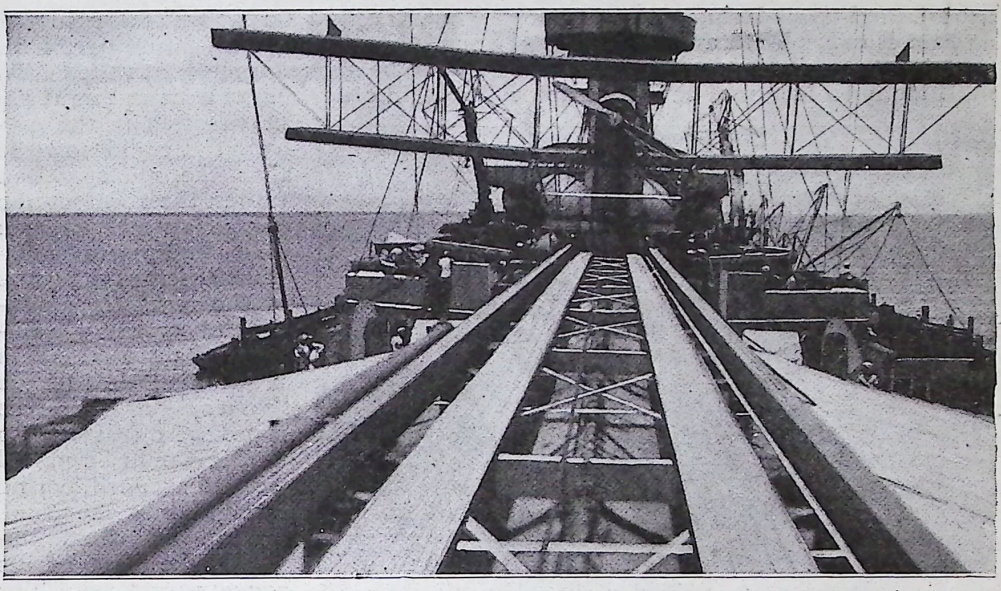


Aloft in an Observation Balloon during a Strong Wind Which is Flattening the Nose of the Gas Bag: The Observer may be Seen in the Basket at the Bottom of the Picture

Besides placing a wind pennant at one end of the bridge, assurance is made doubly sure by the turning on of a jet of steam in the center of the extreme tip of the launching stage. When the back-blown steam streams straight along the middle plank of the stage, the wind is right.

The captain, from the bridge, lifts a small white flag as a signal to the wing commander that all is ready. The latter nods to the pilot, who starts his engine at full speed, while two mechanicians, braced against cleats on the deck, hold back the tugging plane. If the "tone" of the engine is right, the wing commander (standing in front of the plane and a little to one side) brings down his red-and-yellow flag with a sharp jerk, falls on his face to avoid a collision, and the machine, freed from the grip of the men holding it, jumps away. The next two seconds tell the tale, for if a seaplane gets off the deck properly, the rest of its flight is not likely to be eventful.

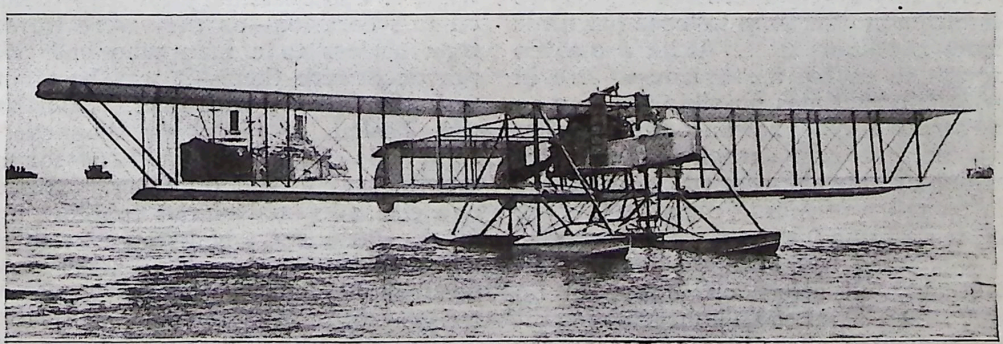
All of the dozen or more launchings attempted that afternoon were successful, though one big bombing plane, whose engine began missing the instant it started, gave everyone, from the captain down, a bit of a turn when it "drooled over the bow like cold treacle" (as a bo'sun aptly put it), and swooped down toward the water in what was almost a dive, before picking up and mounting aloft. The launching stage was something over a hundred feet long, and sloped downward at a grade of about five per cent. The light scouts and chasers—



Making Ready to Put Off: A Seaplane about to Go Aloft. After the Motor has Had Its Necessary Tuning, the Vessel is Swung Dead into the Teeth of the Wind with Full Steam Ahead

if their pilots cared to—jumped into the air at sharp angles before traversing half the run, but the big two-seaters were glad of every inch available to get going in. Indeed, their pilots are practically under orders to take no chances on this score, for the sequel to an attempt to rise too quickly from a ship is far different from on land, where the machine simply comes back and begins to run along the ground again. The machine also settles back in the former instance, but rarely with enough run left to get up again. The result is a flounder over the bow, which may itself be followed by the plane being run down by the ship.

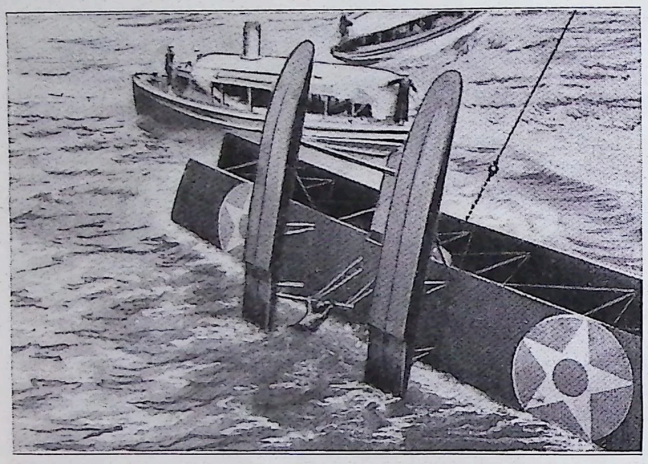
On practice, a seaplane sails over and drops its detachable wheels near a waiting drifter, which latter picks them up and returns them to the ship. The machine swoops low and "kicks" loose the "spares" at a hundred feet or less above the surface of the water, and a pilot who let his wheels go from a considerably greater altitude drew a growl from the bridge, as a long fall is likely to injure them. Its flight over, a plane returns to the ship by alighting on the water several hundred yards



OFFICIAL DARDANELLES PHOTO

Here Is a Full-Grown "Sea Gull" Sunning Itself on a Placid Sea. The Machine Is a Bombing Plane Attached to a British Fleet on Patrol Duty in Near-Eastern Waters. Its Mother Ship is Shown in the Background

astern, and floundering up alongside as best it can. With a high wind and a choppy sea, it is rough work. The machine is so balanced that its tractor propeller should revolve in the air and clear the water by several inches, even in a rough sea. It will occasionally strike into "green water," however, which is always likely to shatter the ends of the blades, if nothing else. The sheathing of the blades with metal affords considerable protection, though a certain risk is always present. The operation of picking a seaplane up and hoisting it aboard is a nice piece of seamanship at best, and in bad weather is practically an impossibility. With the wind much above 30 miles an hour, indeed, only a very real need is likely to induce a mother ship to loose her birds from the home nest. With a sea too rough to enable a seaplane to live in it, it is sometimes possible to carry on imperative reconnaisance by sending up an ordinary aeroplane (some of which are always carried), though the latter must, of course, make its landing on terra firma when its work is over.



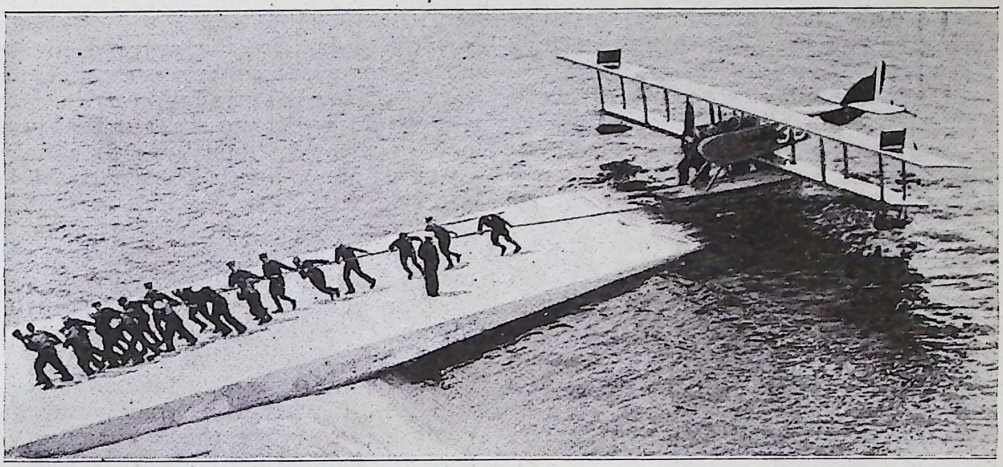
Alighting on a Choppy Sea in a High Wind Is Not as Pleasant an Affair as Those Involved might Wish. Here Things have Gone Awry, and Rescue Launches are Approaching. Note Airman Clinging between the Pontoons

The wind had been freshening considerably all afternoon, but with no more than 30 miles an hour showing on the indicator, there was no reason for not letting me have my balloon ride.

As the time approached for its ascent, the balloon was allowed to rise far enough from the deck to permit its car to be shoved underneath the center of it, in order that the latter might not be dragged in the getaway. I could now see that the monster had rather the form of the bag of an airship than the "silkworm-with-stomach-cramps" shape of the regulation modern observation balloon. Its nose was less blunt than that of the "sausage," and the ropes were attached so that it would be pulled with that nose boring straight into the wind, instead of tilted upward like that of its army prototype. The three stabilizers at its stern were located, and appeared to function similarly to those of the "sausage." They were not inflated with gas, but, opening funnel-mouthed toward the front, were calculated to fill with wind and act as rudders to hold the kite steady.

The basket was mid-waist deep, and just big enough to hold comfortably two men sitting on the strips of canvas which served as seats. Supplementing our jackets, two small life preservers of the ordinary type were lashed to the inside of the basket. When I asked about parachutes, I was told that, while it was customary to carry them, on this occasion—as they were worse than useless to a man who had not practiced with them—it was best not to bother myself with one. "Stick to the basket if anything happens," some one said; "it will float for a month, even if full of water." Some one else admonished not to blow up my jacket until we had stopped rising, lest it (from the expanding air, I suppose) should in turn blow me up. Then we were off.

The old "X——" was lying well down toward one end of the mighty bay, so that without turning his head,



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Drawing a Seaplane from the Water at a Naval Aeronautical Station Following a Flight: For Coast Patrol and Submarine Detection the Flying Boat, Seaplane, and Small Dirigible have Long Since Demonstrated Great Worth

one could sweep his eyes over the single greatest unit of far-reaching might in the whole world war, the Grand Fleet of the British Navy. And in no other way than in ascending in a balloon or a flying machine could one attain a vantage from which the whole of the fleet could be seen. Looking from the loftiest fighting top, from the highest hill of the islands, there was always a point in the distance beyond which there was simply an amorphous slaty blur of ships melting into the loom of the encircling islands. But now those mysterious blurs were crystallizing into definite lines of cleavage, and soon—save where some especially fantastic trick of camouflage made one ship look like two in collision, or played some other equally scurvy trick on the vision—I could pick out not only battleships, but cruisers, destroyers, submarines, ranged class by class and row on row. Even the method in the apparent madness with which the swarms of supply ships were scattered about was discernible.

We were towing with the cable forming an angle of about 60° with the surface of the water now, and running up to us straight over the port quarter. The ship had thinned down to an astonishingly slender sliver, not unsuggestive of a speeding arrow whose feathered shaft was represented by the foaming wake.

"She's three or four points off the wind," commented my companion, "and yet—once we've steadied down—you see it doesn't make much difference in the weather we make of it. A head wind is desirable in getting up to keep from fouling the upper works amidships, but we hardly need to figure it down to the last degree as in launching a seaplane. When we're really trying to find something, of course we have to work in any slant of wind that happens to be blowing. The worst condition is a wind from anywhere abaft the beam, blowing at a faster rate than the towing ship is moving through the water. In that case the balloon simply drifts ahead to the end of its tether, swings around and gives the ship a tow. If the wind is strong enough—say 40 miles an hour, with the ship doing 20—to make it give a good steady pull on the cable, it is not so bad, but when it is touch-and-go between ship and wind the poor old kite is all over the shop, and about as difficult to work in as to ride in—which is saying a good deal."

"What do you mean by work?" I asked.

"Looking out for things and reporting them to the ship over the tele-

phone," was the reply. "Perhaps even trying to run them down and destroy them."

"Can't we play at a bit of work now?" I suggested. "Supposing we were at sea, and you saw what you thought to be the wake of the periscope of a U-boat a few miles away. What would you do?"

My companion laughed. "Well," he said, "if I had the old 'X——' down there on the other end of the string, I should simply report the bearing and approximate distance of the periscope over the telephone, and let her do the rest."

"And what would the rest consist in?" I asked.

"Principally in turning tail and running at top speed for the nearest protected waters," was the reply, "and incidentally 'broadcasting' a radio giving the position of the U-boat and the direction in which it was moving."

"But supposing it was a destroyer we had on the string," I persisted; "and that you had no other present interest in the world beyond the finding of one of these little V-shaped ripples. The *modus operandi* would vary a bit in that case, wouldn't it?"

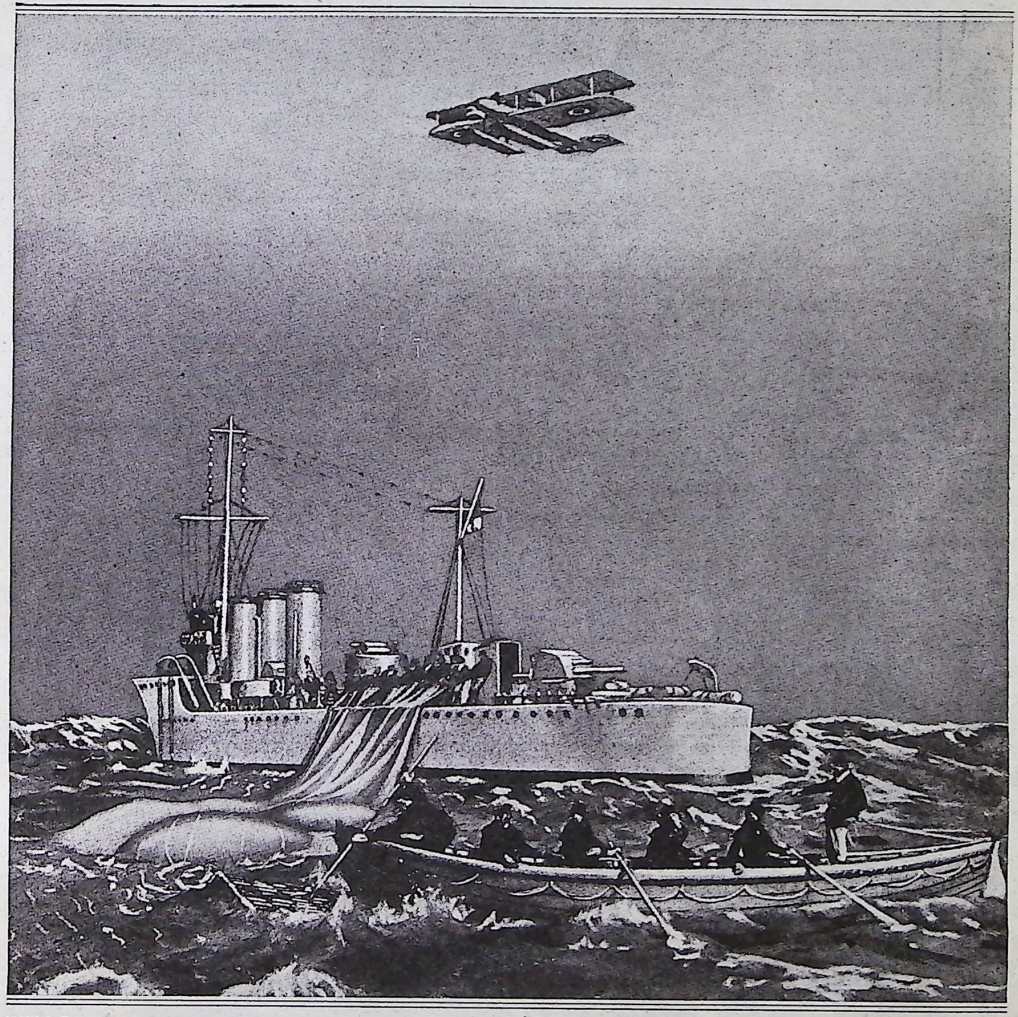
"Radically," he admitted. "I would give the destroyer what I figured was the shortest possible course to bring her into the vicinity of the U-boat. As long as the wake of the periscope was visible, I would correct that course from time to time, by ordering so many degrees to port or to starboard, as the case might be. As soon as the periscope disappeared—which it would do, of course, just as soon as the eye at the bottom of it saw the kite—I would merely make a guess at the submarine's most likely course, and steer the destroyer to converge with that. Our success or failure would then hinge upon whether or not I could get my eye on the submarine where it lurked or was making off under water. In that event—provided only there was enough light left to work with—it would be long odds against that U-boat ever seeing Wilhelmshafen again. Just as you guide a horse by turning it to left or right at the tug of a rein, so—by giving the destroyer a course, now to one side, now to the other, until it was headed straight over its prey—I would guide the craft at the other end of the telephone wire to a point from which a depth charge could be dropped with telling effect. If conditions were favorable, I might even be able to form a rough estimate of the distance of the U-boat beneath the surface, to help in setting the hydrostat of the charge to explode at the proper depth. If the first shot fails to do the business, we have only to double back and let off another. Nothing but the coming of night or the blowing up of a storm is likely to save that U-boat once we've spotted it where it skulks."

"Is it difficult to pick up a submarine under water?" I asked.

"That depends largely upon the light and the amount of sea running," was the reply. "Conditions are by no means so favorable as in the Mediterranean, but at the same time they are much better than in some other parts of the North Sea and the Atlantic. The condition of the surface of the water also has a lot to do with it. You can see a lot deeper when the sea is glassy smooth than when it is even slightly rippled."

I remarked on the fact that—in spite of the heavy wind—our basket was riding more steadily than that of any stationary observation balloon I had ever been up in at the front. "It yaws a bit," I observed, "but I have never been up in a balloon with less of that 'jig-a-jig' movement which makes it so hard to fix an object with your glasses."

"The latest stabilizers have just about eliminated the troublesome jig-a-jig," replied my companion; "but as for yawing — well, a fore-and-aft schooner running under full sail before a following gale is nothing to what a kite can do if—if your friends on the towing ship don't happen to be trying to—to give their passengers an easy ride. You will get some idea of what it is if the ship is still at full speed when they begin to wind us in, or even if she



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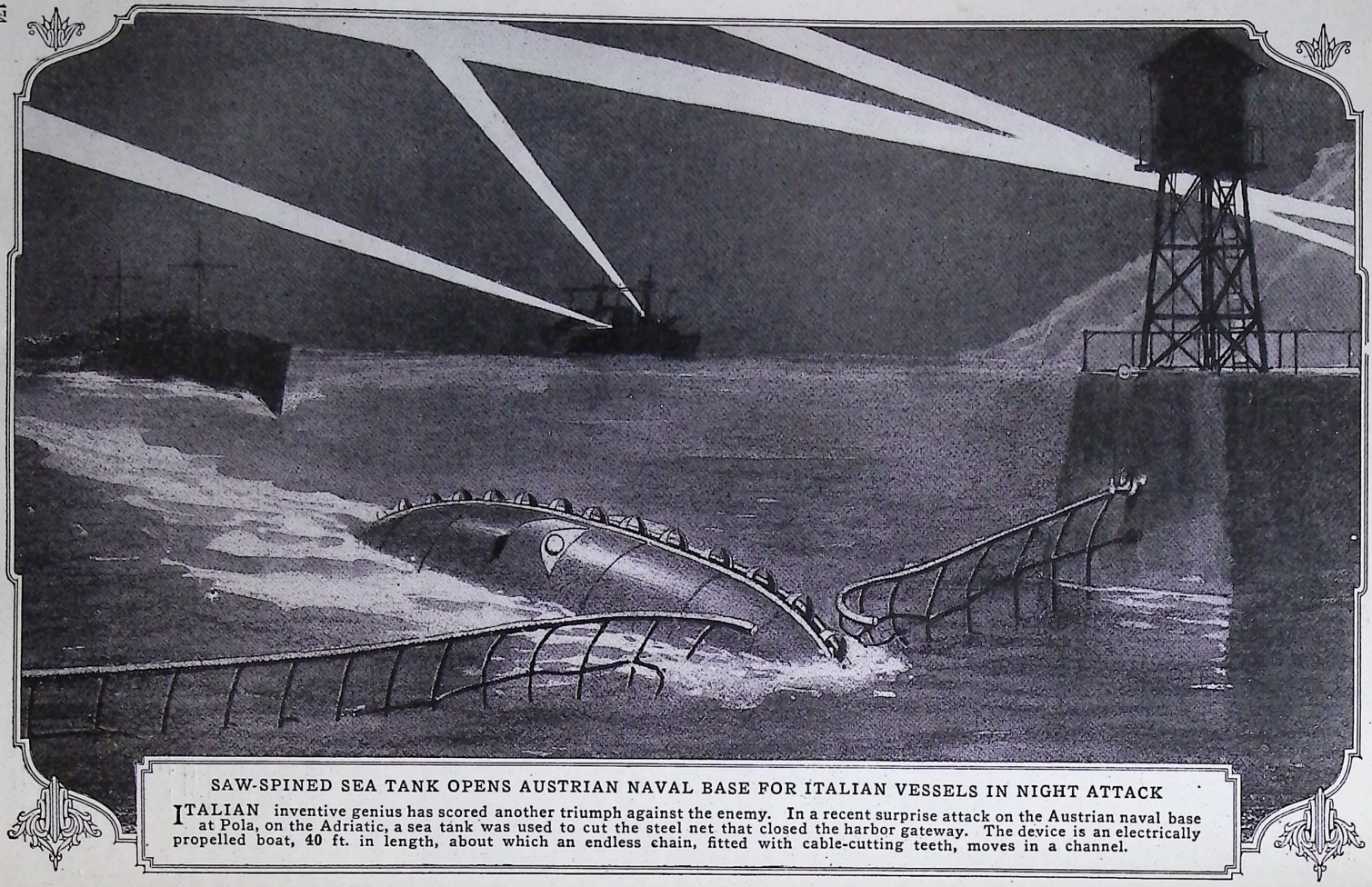
Summoned by a Seaplane, a British Destroyer is Here Seen Salvaging the Wreck of an Observation Balloon at Sea. The Aerial Scout is Circling Overhead in Quest of the Missing Observers Who were Not Found Clinging to the Basket

changes her course more than a point or two. If they should happen to do both at once you'll have a sensation to remember your ride by. One minute you—Hello!—" (he bent to his telephone transmitter) "Balloon speaking—going to wind us in—want to put some more seaplanes off—Right-o!—Carry on!"

He turned to me with a grin. "You're in luck," he said. "Ship's heading up into the wind to let a seaplane go just as they're ready to wind us in. You'll learn now why they call one of these balloons a kite. There they go! Hold fast!"

There was a sudden side-winding jerk, and then that perfectly good seascape — Grand Fleet, Orkneys, the north end of Scotland and all — was hashed up into something full of zigzag lines like a futuristic masterpiece or the latest thing in scientific camouflaging. The wild cross-sky slashings lasted only while the first hundred feet or so of the cable was being wound in.



SAW-SPINED SEA TANK OPENS AUSTRIAN NAVAL BASE FOR ITALIAN VESSELS IN NIGHT ATTACK

ITALIAN inventive genius has scored another triumph against the enemy. In a recent surprise attack on the Austrian naval base at Pola, on the Adriatic, a sea tank was used to cut the steel net that closed the harbor gateway. The device is an electrically propelled boat, 40 ft. in length, about which an endless chain, fitted with cable-cutting teeth, moves in a channel.

WHITE WIND-OBSERVATION BALLOONS MADE BY DUTCH

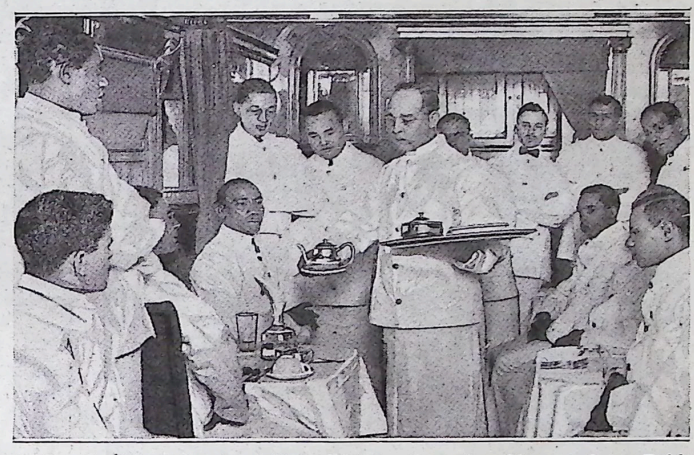
Balloons made of pure rubber for meteorological observations are now being successfully produced in Holland. Bags made in a garage at Utrecht, it is announced, are, after a certain chemical treatment, even better adapted for such work than the caoutchouc balloons formerly manufactured in France, which now on account of war conditions are unavailable. When the supply of the latter bags was cut off in 1916, the Royal Netherlands Meteorological Institute was confronted with the alternative of finding some way of producing similar ones in Holland or suspending the work of making observations in the upper atmosphere. As a result the new balloons, which have enabled observations to be made at heights greater than nine miles, were produced after considerable experimenting. They are described as being pure white and thoroughly transparent, and therefore more easily observed with a telescope than those of yellowish tinge heretofore employed.

GOLD MINERS MAKE BRICKS FROM SLIME AND CLAY

The slime which accumulates at the various mines in the Kolar goldfields, in India, is now being mixed with clay and made into bricks, instead of being treated as a waste product, as heretofore. The bricks made in this way are said to be superior to those acquired from outside sources and are used extensively in lining circular shafts and other construction work carried on by the mining companies. Later on it is proposed to make fire brick, clay crucibles, and artificial stone.

WAITER'S TRADE IS TAUGHT IN DINING-CAR SCHOOL

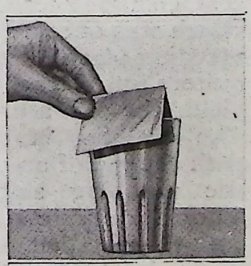
That every waiter employed in its dining cars may know the correct way to set a table and serve a meal, the Southern Pacific Railroad maintains a school where these things are taught. It is held in a standard dining car, the old and experienced waiters presiding and showing the new employes what is proper usage in every particular.



A Class in Meal Serving: New Waiters Learning How to Set a Table Correctly and Attend to Patrons' Wants in a Dining Car; the Instruction is Given by Men Experienced in the Service

PAPER GUARDS TO MAKE GLASSES SANITARY

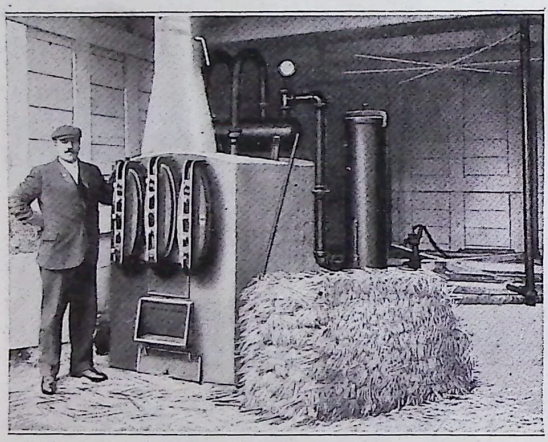
In certain hospitals in France the American Red Cross has provided a pad of paper with each drinking glass which is used by more than one person. Before drinking from the glass a sheet of paper is torn from the pad, folded double, and fitted over the edge of the glass as a protection to the lips of the drinker. Each sheet is, of course, used but once, thus lessening the chances of contagion. These simple guards are more easy to obtain than paper drinking cups.



COURTESY OF JE SAIS TOUT

PLANT FOR FARMS MAKES GAS FROM STRAW

An outfit that produces fuel and lighting gas from straw is a new Canadian invention, which, it is claimed, offers a practical means for utilizing the vast quantities of straw that now go to waste on the western plains, and at the same time may solve the fuel problem for that region. The new producer is not large, being designed for individual farm use. The gas is made in a retort equipped with three cylinders, each of which holds a bale of straw, 7 ft. long, 2 ft. wide, and 6 in. thick.

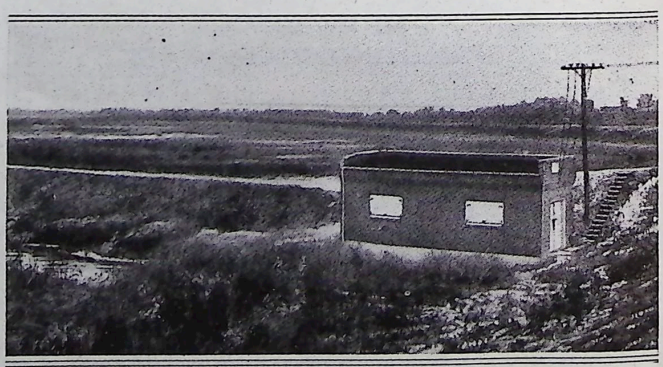


Farmer's Gas Plant Which Produces Gas for Heating, Lighting, and Cooking, from Straw Which Formerly was Wasted

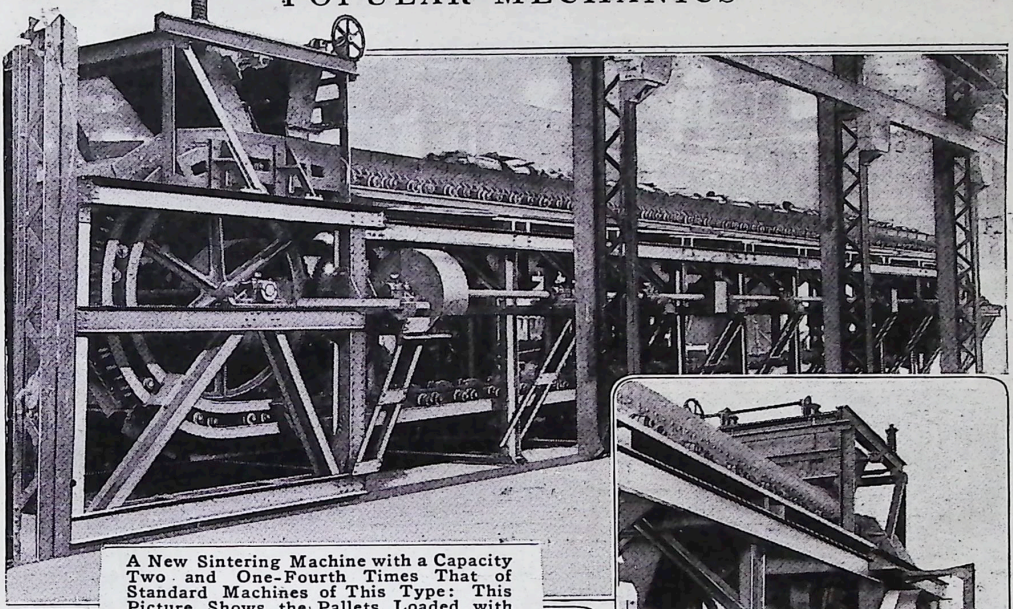
After filling and closing these chambers, a straw or gas fire is lighted under them and allowed to burn 30 or 40 minutes. One firing with wheat, oat, barley, or flax straw in this manner produces 1,200 cu. ft. of gas having fuel value of 400 B. t. u.—enough gas for one winter day's needs on an average farm. After the gas has been produced it passes through a scrubber to remove the tar and ammonia and thence into a gasometer. About 12,600 cu. ft. of gas can usually be generated from one ton of straw; and in addition six to eight gallons of tar and 640 lb. of carbon, from which lampblack can be obtained. To provide all the heat, light, and power that an average farmer needs would require 30 to 40 tons of straw, which amount is less than that produced on many farms. The cost of the plant is in the neighborhood of $500, and the by-products derived from it are said to pay for the cost of baling the straw.

CITY RECLAIMS BIG TRACT AT SMALL COST

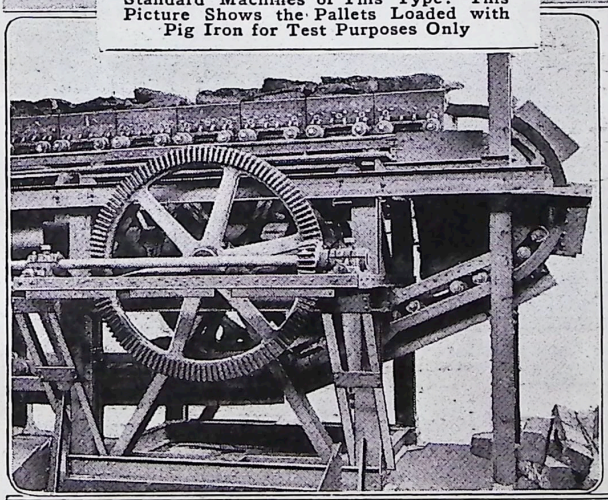
Some 2,000 acres of lowland has been reclaimed by the city of Toledo at small cost, changing territory which was once a great breeding place for mosquitoes into a tract that yields the city a profit. The draining is done with the aid of an electric pumping station, automatically controlled, installed in a small brick building. The repairs on the machinery are very slight, making the current practically the only item of expense and this is obtained at low cost from the city's electric-power and light plant.

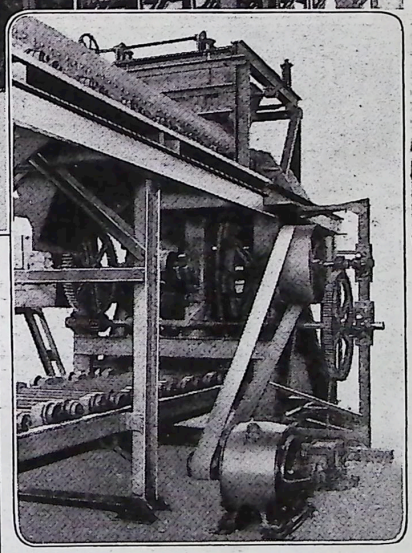


With the Help of the Automatic Pumps in This Little Station, Toledo has Reclaimed 2,000 Acres of Land That Formerly Was a Breeding Place for Mosquitoes



A New Sintering Machine with a Capacity Two and One-Fourth Times That of Standard Machines of This Type: This Picture Shows the Pallets Loaded with Pig Iron for Test Purposes Only





Above: The Drive End Showing Motor by Which the Pallets are Driven on the Endless Track. Left: The Discharge End. Each Pallet in Turn Runs Swiftly Down the Incline, Discharging Its Load and Striking the Unit Ahead

BIG SINTERING MACHINE HAS NEW FEATURES

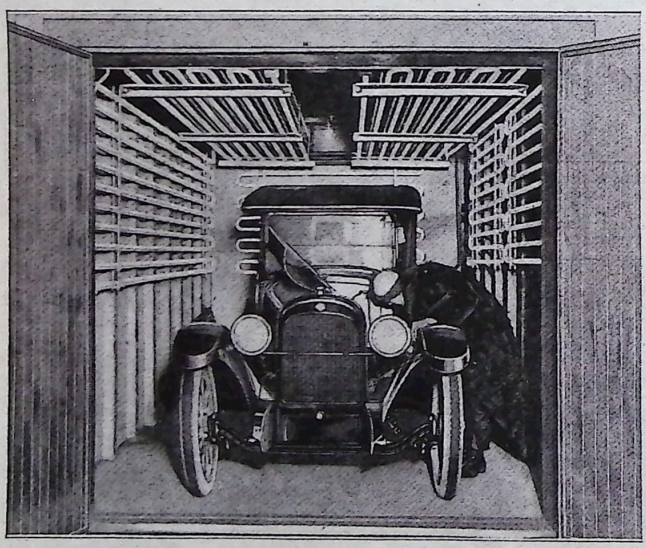
A new sintering machine with which blast-furnace flue dust, and the like, is put through a caking process so that it can again be treated in a furnace, has been built, having a capacity of two and one-fourth times that of standard machines of this type. The numerous pallets, or carriers with grate bottoms, on which the moistened flue dust is dumped, differ from others in that they travel on wheels. These pallets are driven along an endless track, like an endless conveyor, by big cogged wheels at either end of the machine.

On being loaded with flue dust, they pass beneath a hot flame which starts the sintering, after which they pass over "wind boxes." Here suction draws the fire downward through the dust, completing the process. The active grate of the big machine is 42 in.

wide and 57 ft. 4 in. long. Arriving at the end of the upper level of the endless track, each unit, being unattached to those next to it, rolls swiftly down the incline, discharges its load, and strikes the unit ahead. It then makes the return trip, upside down, along the lower level. The machine can produce from 300 to 350 tons of sinter per 24 hours, from flue dust.

MOTOR-TESTING LABORATORY IS BIG REFRIGERATOR

At one of the well-known motor-car factories use is made of an interesting experimental laboratory. It consists of a refrigeration room in which the temperature may be lowered to 15° below zero. In it cars are subjected to atmospheric conditions similar to those they encounter in severe winter weather, and their performance carefully studied. Low temperature causes oil to congeal, interferes with the vaporization of fuel, and in other ways influences the operation of a motor. The cold room enables tests of various starting devices, batteries, carburetors, and vaporizers to be conducted.



Bundled in Winter Clothing in Midsummer, an Expert Mechanic Watches a Motor Perform in the Cold Room, Where a Temperature of 15 Degrees below Zero Is Maintained

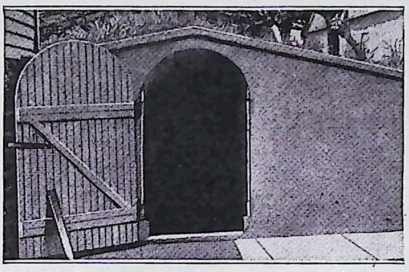
¶ The first trip by aeroplane across the Sahara Desert is said to have been made recently by three machines in seven hours, with but one landing.

POTASH IS NOW OBTAINED FROM SUGAR BEETS

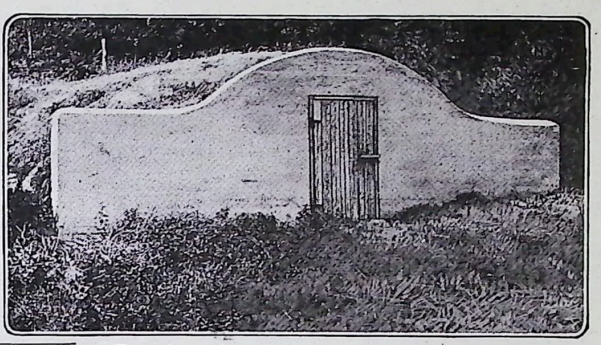
Potash is being produced as a by-product of the beet-sugar industry. The content of potassium carbonate in sugar beets is not large, but at this time of serious shortage and exorbitant prices, it amounts to enough to make recovery commercially feasible. The product is obtained from the "waste water" that remains after working the molasses left at the completion of the first step in sugar manufacture. When all of the water has been evaporated and the solids burned, a mineral ash is left which contains about 35 per cent potash. Practice has shown that approximately four pounds of potassium carbonate are to be obtained in this manner from a ton of sugar beets. It is estimated that 4,000 tons of potash are available annually in the sugar beets grown in Colorado alone.

CONCRETE STORAGE CELLARS FOR FOOD CONSERVATION

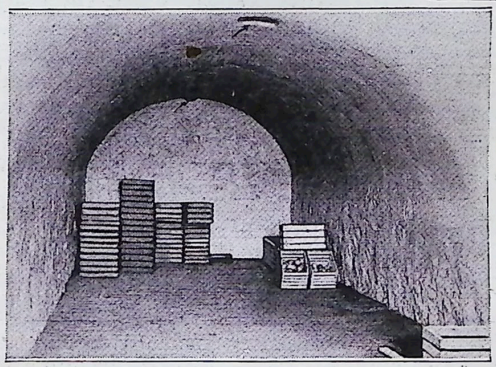
It is a well-known fact that an enormous percentage of the perishable farm products grown annually is lost on account of improper storage. War conditions are doing much to call attention to this preventable waste and cause measures to be taken to offset it. Rightly constructed, a concrete storage vault will keep certain fruits and vegetables in good condition from



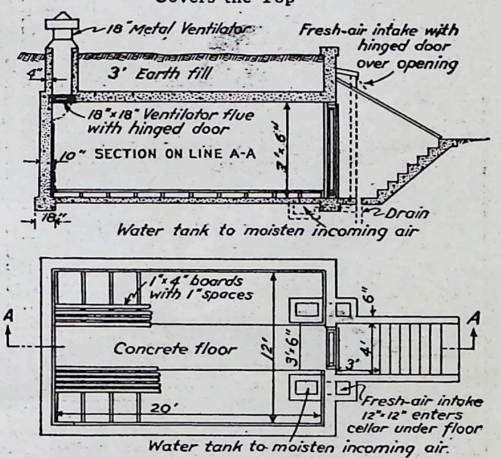
When Built Adjacent to a Residence, So as to Be Convenient of Access from the Kitchen, a Storage Vault Is a Great Convenience



Exterior of a Reinforced-Concrete Arched Vault Used for the Storage of Perishable Farm Produce: A Three-Foot Earth Fill Covers the Top



Showing the Interior of a Well-Constructed Storage Chamber: An Arrow Indicates One of the Ventilators Installed in the Arched Ceiling

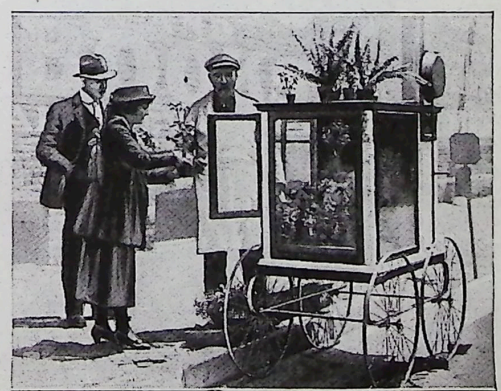


The Diagrams Present General Plans for the Erection of a Scientifically Planned Underground Storage Vault to be Built of Concrete

one season's end to the next. Concrete is particularly adapted for purposes of this sort for it is not only an easily employed material, but one that provides a structure of permanence that is proof against rats. Plans for the construction of scientifically designed storage chambers, arranged with proper ventilating facilities, are available without cost.

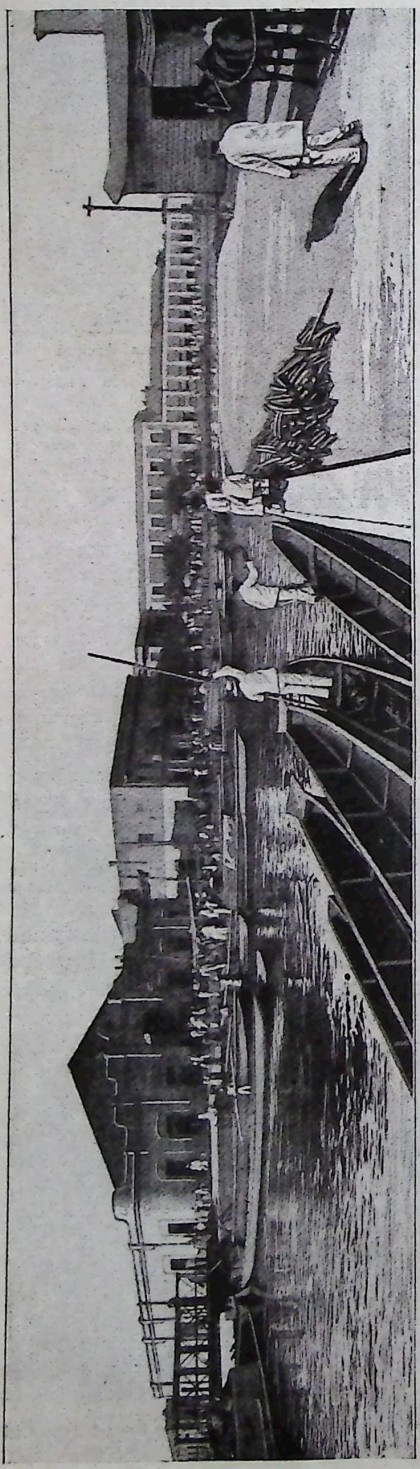
PEANUT WAGON CONVERTED INTO PLANT CARRIER

Confronted by the rising prices of peanuts and popcorn, a street vender dealing in these articles decided to utilize his peanut wagon, with a glass-inclosed top, for selling potted plants. The change has proven a very profitable one. The gasoline tank is now filled with water and the pipe provided with a shut-off valve and a hose connection for sprinkling the stock carried in the wagon. In case any customer desires more plants than are in stock, the order is taken and the goods are supplied from the home nursery where the vender raises all his plants.



COPYRIGHT, JOHN EDWIN HOGG

Wagon of a Peanut Vender Who Found His Old Business Unprofitable and So Utilizes His Outfit for Selling Potted Plants



Primitive and Up-to-Date Aspects of the Coffee Trade in South America: Scene in a Colombia Town, Showing a Modern Concrete Warehouse to Which Natives have Brought Coffee in Queer Log Boats

PRIMITIVE AND MODERN IN COFFEE TRADE

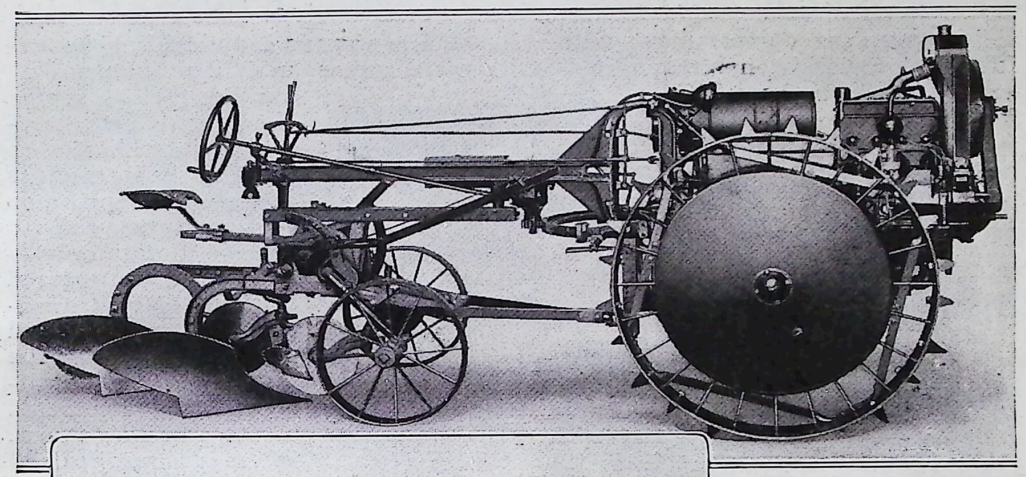
Typical of the contrasts which are to be found in South America, where at many points civilization is coming in contact with native life, is the accompanying scene from Colombia. On the far shore is a modern concrete warehouse, with a metal roof, equipped in an up-to-date fashion, while in the foreground are primitive boats and their native owners, who use them to bring coffee and other produce to the warehouse. These craft are as much as 60 and 70 ft. long and are made from logs burned out and cut hollow, giving them considerable capacity.

NEW RADIO STATION LINKS NORWAY AND AMERICA

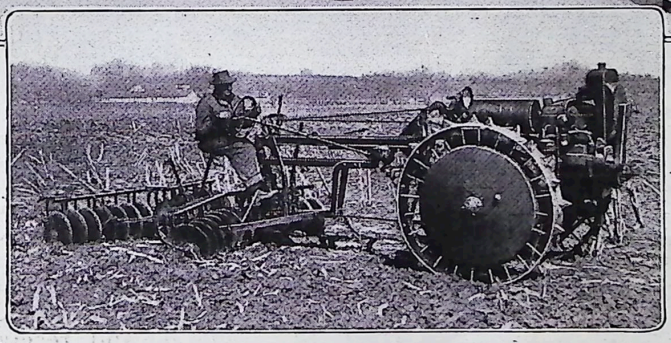
One of the most powerful and modernly equipped wireless stations in the world has recently been completed near Stavanger, on the southwest coast of Norway, by the Norwegian government, for communication with the United States. The masts of the station are 400 ft. high. It is predicted that the new sending and receiving plants will make Norway the center of future telegraphic communication between Europe and the United States. A factor contributing to this is the reduction in rates which has been effected, the cost per word sent to this country being 24 cents instead of 34 cents, the corresponding cable rate. The station is of the duplex type, so that it is able to do work in both directions simultaneously, and at a higher speed than is attainable with the Atlantic cable. The field of service open to the new station is indicated by last year's cablegram traffic between Norway and America, which was 4,000,000 words.

¶ A postal authority has announced that "planepost" and "planeposted" are the correct noun and verb, respectively, to use in referring to our aerial mail service.

TRACTOR OF ORIGINAL FORM HAS CAPABLE LOOK



Ninety-Eight Per Cent of the Weight is Balanced on the Driving Wheels. The Operator Rides the Implement the Same as If It were Drawn by Horses



Change from One Implement to Another is Made in a Few Minutes' Time. The Tractor is Built High So That It Is Suitable for Cultivating as Well as Plowing

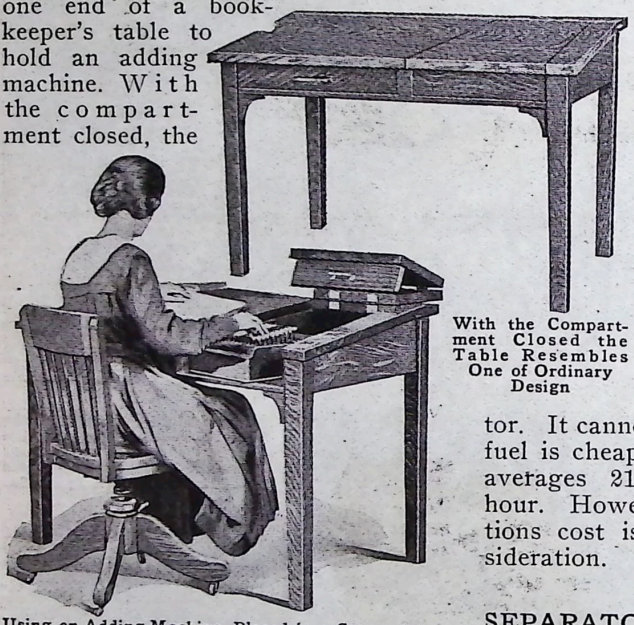
Among the new farm tractors that bear the earmarks of logical design, there is one with characteristics that are particularly striking. It is a two-wheeled contrivance with the connecting rod and steering column extending far rearward so that when a riding plow or a cultivator is attached, the farmer occupies the seat on the implement as if he were using horses. This arrangement makes it possible for one man to drive the tractor and control the implement regardless of the kind of work that happens to be in hand. Ninety-eight per cent of the tractor's weight is balanced on the driving wheels. This obviously aids traction and also makes it easy to change from one implement to another. The rear end of the machine is as readily lifted as the tongue of a wagon. The left wheel is arranged so that it may be raised or lowered by the engine when plowing is done, thus keeping the tractor level at all times. The internal gear and bull pinion on each wheel are protected from dirt and sand by shields.

GIANT HUN BATTLEPLANE CARRIES EIGHT AIRMEN

According to a recent French official statement, a German aeroplane of unusual proportions has been felled on the western front. The machine, described as a "grand model," is probably a large battleplane. It was brought down in the region of Nanteuil-le-Haudouin, undoubtedly intact, for mention is made that its crew of eight airmen was taken prisoner. The craft mounts four motors and is the largest and most powerful plane that has so far made its appearance.

OFFICE TABLE HAS PLACE FOR ADDING MACHINE

A convenient compartment with a folding top has been incorporated in one end of a bookkeeper's table to hold an adding machine. With the compartment closed, the table resembles one of ordinary design with a slanting top. To make the computing device accessible it is only necessary to fold the hinged top back and draw the machine forward a little. The top of the table and the machine are both at the proper height for a seated bookkeeper.



With the Compartment Closed the Table Resembles One of Ordinary Design

Using an Adding Machine, Placed in a Compartment Conveniently Located in One End of a Bookkeeper's Table

DETACHABLE FUEL TANK MAKES FLYING SAFER

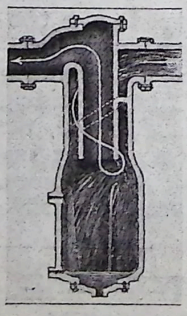
A detachable fuel tank which can be hurled from an aeroplane merely by moving a lever, no matter what the machine's position, is a device recently invented for the benefit of fliers. A majority of accidents to airmen, it is estimated, are due to fire or explosions, and this apparatus makes it possible for the flier to get rid of his fuel the moment he sees it may ignite. An emergency receptacle is provided which furnishes fuel for a descent.

CARBIDE USED AS MOTOR FUEL IN NORWAY

While various individuals have had limited success in driving motors with carbide, the work of a Norwegian boat captain along this line is particularly interesting because his apparatus — so far adapted to benzine motors only — is being manufactured in quite large quantities. Water is dropped through a tube onto the carbide and the resulting gas is conducted to the carburetor, where it is purified and then driven to the motor. It cannot be claimed that the new fuel is cheap, for in Norway the cost averages 21 cents per horsepower-hour. However, under present conditions cost is often a secondary consideration.

SEPARATOR REMOVES WATER FROM COMPRESSED AIR

A simple air separator, now being manufactured for installation on pneumatic pipes, frees the air within of moisture without appreciable loss of pressure. It consists of a cylindrical chamber containing sets of baffles that abruptly divert the air from its course. As it enters the device, the air is thrust downward in a spiral path and then upward through a centrally located passage that leads back to the pipe. Baffles in the lower end of the chamber are also provided. As the air follows its circuitous course, centrifugal force throws the particles of moisture against the chamber walls and they gradually collect at the bottom of the trap.



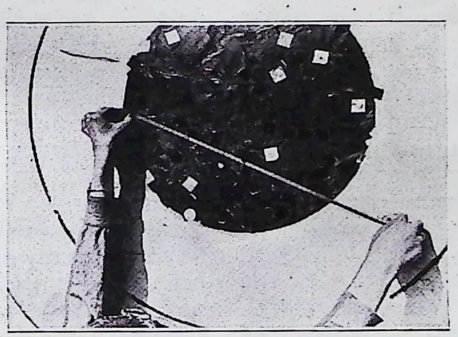
THE RIFLE OF THE HUN

By Edward C. Crossman

In a Number of Respects the German Mauser Rifle Offers Its Users Advantage over British and American Fighters. This Shows the Writer Trying Out One of the Pieces at an 800-Yard Range

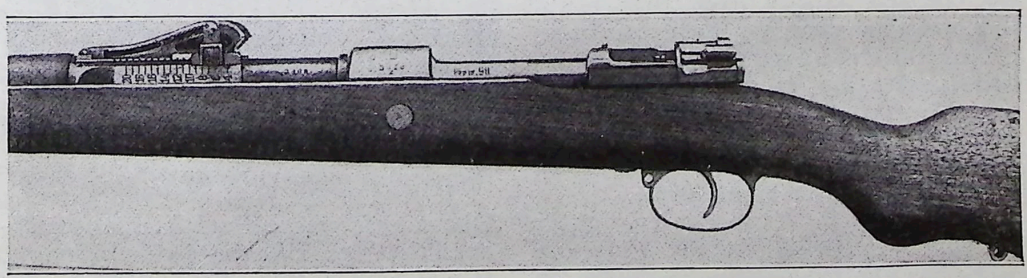
IN the hands of the chap in the sloppy greenish-gray uniform, watchfully waiting in the trench across the way, there is a rifle with higher velocity than ours, with nearly a foot greater stabbing length, when the bayonet is fixed, and with a better stock, making snap-shooting and shooting at night more certain.

The rifle of a nation that has specialized on war and its tools, the German Mauser in some respects offers serious advantage to its user over the new Springfield of the American forces. The weak point is the man behind. It gives unquestionable advantage in bayonet fighting—but the Hun doesn't like the bayonet, and therefore gets licked in spite of his superiority in weapon. It gives higher speed to its bullet—but the German soldier is usually a poor shot, and even the little, antiquated, patched-up, short Lee-Enfield of England proved too much for the better Mauser, because it was in the hands of better men and better rifle shots. The stock is better than the stock on either new Springfield or our newer M1917, modified Enfield, but the bolt handle is so clumsy that the superior speed of fire of the American rifle neutralizes this advantage and gives us a lead into the bargain.



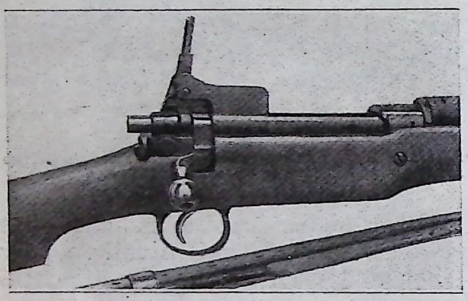
At a Range of 550 Yards, the Mauser Hit the Target Five Times in Succession between the Points Indicated by the Two Hands in the Photograph

Because the Hun Mauser is so much longer with bayonet fixed than is our new Springfield—a matter of 10 in.—and is longer by a lesser degree than our M1917, the American soldier is not taught any de-



Mauser Number 2668, Captured at the Battle of the Somme in 1916, Its Stock Scarred as if It had been Used on Barbed Wire, but Its Bore as Bright and Clean as When It Left the Factory

fense in bayonet fighting. All his moves are on the offensive. One cannot stand on the defensive with the other chap having 10 in. greater reach to the brutal, entrail-catching, saw-backed bayonet, but the skilled and vicious attacker can immediately neu-



The Breech of the British Enfield: The Difference between It and the Mauser Is Instantly Noticeable Even to the Casual Observer

tralize all the advantage by the vigor and the speed of his attack.

If the fight is in the open, and there is room enough, the Hun soldier makes one vicious and most dangerous move to settle the fight by immediately calling into play the celebrated "throw point" of the German infantry. Standing, as he does on the defensive or guard position, knees bent, rifle held across the body with the butt near the ground, not with bayonet extended as in the old American position of "guard," he gives no warning of the menace that lies in that half-squatting position.

But the instant the American or the French or the British soldier has stepped across the imaginary dead line in the mind of the Hun—10 or 11 feet from him and seemingly too far for danger from that brutal bayonet—he suddenly hurls the muzzle of the rifle forward with the left hand, releasing it as he does, then takes a step forward with the right foot, thrusting out the right arm full length, with the extended rifle in the grip of the right hand alone.

In the hands of the skilled fighter, the bayonet licks out the long distance like the flash of the head of a rattlesnake—nor is the simile a bad one, for the sudden and vicious throw of the bayonet end of the rifle from the quiet crouching position is the strike of the snake to the last detail. The throw point will reach, in the hands of the skilled man, 11 feet or so—and woe to him who doesn't know what is coming and how to avoid it.

It is the last move of the just begun fight, other things not interfering. The rifle, held in but one hand, and in the hand of a man off his balance, is easily deflected from its course by the quick, alert opponent, while his return thrust is sure to go home to the momentarily helpless Hun. Either the German bayonet thuds fair into the soldier at which it is so viciously hurled, or else it misses and the other man finishes things with a step in, and a sudden upward thrust of his own bayonet. Wherefore, because the American soldier is taught no defense, save the parry to this throw point, and because the German is taught to trust all to this vicious opening of the fight, the American and the German won't waste much time in the elaborate fencing which used to be the style.

The Mauser is undoubtedly superior to any other rifle but the French in a bayonet fight, but just as the British beat it with their shorter Lee-Enfield, our own boys will beat it with their shorter Enfields and Springfields—because of the man behind.

Consider Mauser rifle No. 2668, captured at the Somme, and made in the year 1916 at the German works of

The Range Slide of the Mauser is Moved by One Hand and Automatically Locked by Spring Action. Its Markings Are Distinct and Easily Read

Oberndorf, where Paul Mauser developed the great rifle that bears his name. It was taken by the British in the year in which it was made, but as it lies be-

Stewart Edward White, Now a Major in the Artillery, Familiarizing Himself with the German Rifle: He is Shown Firing over the Parapet of a Trench, at One of the American Training Camps

fore me it looks the part of the battle-scarred veteran. The wood of the stock is chewed up and scarred and full of dents, as if it had been used on barbed wire. But the bore is still clean and bright, testifying to the German efficiency, and the fear of the consequences that compelled its owner to keep it clean in spite of "hell and high water."

The scales say that the rifle weighs 9¼ lb. The M1917 tips the scales at 9¾ lb., both without sling strap, and the oiler and thong case in the recess in the butt of the rifle.

The tape says that the barrel of this German fighting rifle is 29½ in. long. The barrel of the little new Springfield is 24, the barrel of the M1917 is 26. The tape says that the bayonet is so long that it makes the rifle, over all with the knife fixed, just 5 ft. 10 in., or longer than the average man is tall. The Springfield is 4 ft. 11 in. over all with the bayonet fixed. The bayonet weighs but 14 oz., and so this rifle, with the bayonet fixed, weighs without sling, 10 lb. 2 oz. The M1917 with bayonet fixed would weigh nearer to 11 than 10 lb., about 10¾ lb. But the bayonet experts say that the weight is desirable for bayonet fighting, so we can score one for the Yankee rifle in the matter of weight if not in length.

The stock is 13 in. long, or one-fourth more than the Springfield. It is far better shaped, with its neat pistol grip, and semishotgun lines, and it is better shaped than the stock of the M1917, because it fits the shoulder and aids to line up the rifle. In mechanism the rifle is practically the same as the new Springfield and the M1917—which are both modified Mausers.

All three rifles have the magazines within the line of the rifle just ahead of the trigger guard, holding the cartridges in "staggered" formation or double column. All three are loaded by a five-shot charger, or clip, from which the cartridges are stripped into the magazine by pressure of the thumb. I have repeatedly reloaded Springfield or Mauser with five shots in from three to four seconds from the time of the last shot to the raising of the rifle to the shoulder again.

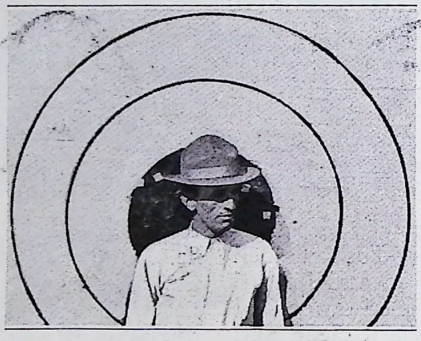
The M1917 rifle holds six cartridges against but five for the Mauser and Springfield, but this is a "by-product" and is not used as now planned, but five shots at a time being loaded into the rifle. With a cartridge in the chamber, the M1917 will hold seven cartridges, the other two six each.

The Hun rifle is not so well made or finished in the barrel as our own rifles. Evidently he cares little for fine accuracy—the accuracy that will let an American rifleman put a dozen straight shots into the 3-ft. bull's-eye at 1,000 yards.

The rear sight on this prisoner rifle is superior to the rear sight on our new Springfield, but much inferior to the rear sight on the M1917. Where the

Springfield rear sight has several notches and a peep all in sight at once, and confusing to the inexpert rifleman, the Mauser has but one: a big, wide, easily caught V-notch. Where the Springfield slide, for giving different ranges, has to be set by the two hands, and locked in place by a thumbscrew, the Mauser is moved by one hand, clicks into the various range marks, and locks itself when you let go of it.

Where the Springfield range marks—200, 300, 500, and 600 yd., for instance—are hard to read, and mixed up with a lot of finer marks for 25 and 50 yd., the figures on the German sight are plain to any man, and have no intermediate marks to confuse or make the reading difficult.



At 550 Yards, the Mauser Put Five Bullets into a Space Narrower Than a Man's Chest, but Not into So Small a Space as Would American Rifles

But it is but an open sight, and any open sight is inferior to a peep sight close to the eye; wherefore, while it is a better fighting sight than that on the Springfield, it is not at all so good a fighting sight as that on the new rifle, the M1917, used by most of the new army.

The side wings of the rear sight, standing up higher than the bar in which is cut the V-notch, make a peculiar open-top square of light. It appears too wide and too inaccurate for practical use, but trial proved that if the Hun soldier but waits until the enemy moves into this square of light, where there is not time to draw a fine sight into the V-notch, he'll infallibly hit him at reasonable ranges. So, in some ways, it is nearly as good as the peep sight on the rear end of the receiver of the M1917 Yankee rifle. We tried it out one day at Camp Kearney, Major White and I, and a lieutenant with a very Teutonic accent, a man who had doubtless served his time with some other army regardless of his love for America now. The African big-game hunter, snapping off his shots in the short time of 1⅗ seconds per shot, from a position below the elbow to the report of the rifle, and using only this square of light for a rear sight, made bull's-eyes on the little 8-in. black spot at 100 yd., or else "fours" close up to the black spot. The lieutenant did nearly as well.

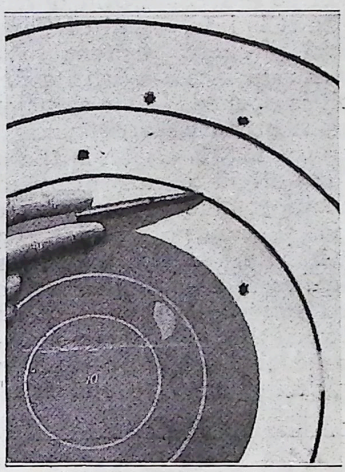
We tried out the Hun rifle at long range, 800 yd., and then some groups at 550. It was accurate enough for fighting—it hit the 3-ft. black spot eight times out of ten shots at 800 yd., with the other two shots not far off. At 550 yd., it put five shots into a space smaller than a man's chest, but not into so small a space as would the two American rifles.

Like the American rifles, the Mauser can be instantly taken apart, without the aid of a tool, so far as the working parts go.

Pull out a little catch on the left side of the receiver, and the bolt slides out of the rifle. Press the point of a bullet into a hole in the floor plate of the magazine—and the magazine and all comes out in the hands. And there is nothing to this magazine but a floor plate, a zigzag flat spring, and a flat piece of steel, called a follower. Press a little catch on the rear end of the bolt—and it screws apart, and can be stripped to its elementary parts. So is the soldier encouraged to care for his rifle and to clean out the grit that might jam it, and to keep out the rust that would roughen its working parts.

The cold paper figures, the tests of the accurate chronograph machines for measuring bullet speed, say that the speed of the Mauser bullet is 2,900 ft. per second, as it leaves the rifle, against 2,700 ft. per second for the bullet of our own rifles. Because of this higher speed the German rifle shoots a bit flatter than does our own, has a longer

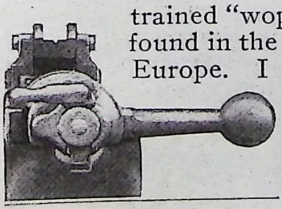
"danger space" over which the rifle shoots so flat that it would not miss a man anywhere in its progress. Also it hits a bit harder blow, and it penetrates more steel. On paper it has a slight advantage, but practically the little Lee of England, with but 2,440 ft. per second velocity, held the Mauser level in actual fighting and rolled back the Teuton hordes when only the Lees stood between the Germans and the Channel ports.



Showing the Effect of Four Shots with a Mauser Rifle at a Range of 200 Yards

But with all the Mauser's good points, it has a point so bad that our Yankee rifles far outclass it in the sort of fighting now done on the fields of Europe. This is that the American rifle, in the hands of skilled American riflemen, will fire, I should say, three or four shots to only two shots for the Hun rifle. Therefore, when the American front bursts into pale flame and light vapor, two American rifles are spitting forth nickel-coated death as fast as three or four German rifles could fire under the same conditions.

The sole difference lies in the silly and clumsy shape of the Mauser bolt handle, the only weak point in the Mauser, but the fatal and necessary concession to the rough-handed, half-trained "wop" type of soldier found in the armies of central Europe. I say half-trained, because as riflemen, they are half-trained; a regiment of American marines of the old days—I don't know about them since war broke out—could lie in a field at 800 yd. and shoot to pieces a regiment of Prussian guards if said guards depended only on their rifle fire to serve them. I know this because I know German systems of training and I know the marines.



Rear Sight of German Rifle and Wings through Which Quick Aim may be Taken

The bolt of most military rifles is revolved through a quarter turn to turn the locking lugs out of bearing with their recesses, and then is drawn to the rear to extract the fired cartridge and eject it. When it is pushed forward it carries a fresh cartridge out of the magazine and slips it into the chamber, which is the rear end of the barrel, and then the bolt is revolved again the quarter turn to the right to lock it.

So the soldier, pulling the trigger, quickly lets go, and slips the hand to the bolt handle to turn the bolt on its long axis, and draw it back in the motions of loading. The lever or handle of the German Mauser sticks straight out horizontally. When it is turned up to unlock the bolt, it sticks into the air, vertically. Not only has the hand to travel quite a distance from trigger to bolt handle, but when the bolt is turned through, and is unlocked, the hand is cramped into a very strained and unnatural position. So marked is this that rapid fire from the shoulder is nearly impossible unless the rifle happens to be lying on a trench parapet, and then it is very slow. Accustomed thoroughly to bolt rifles, I found myself unable, in spite of much practice, to get any speed out of this Mauser bolt, and I fired quite a lot of captured German cartridges.

On the other hand, take the bolt handle of the M1917. You'll remember, as we go along, that the rapid-fire game is the chief game in present fighting, and that the British Tommy is drilled and drilled and drilled as a piano student is worked—all to gain technique, all to make nearly automatic the motions necessary to make the rifle bolt

fly in and out. This is merely because if two men fire 30 shots a minute and four others fire only 15 per minute, the two are quite the equal of the four so far as the volume of fire is concerned.

The bolt handle of our latest rifle is not only bent down, but backward until it lies normally two inches or so nearer to the trigger. The reach to it is less, and the grip is more natural. Where the Mauser bolt handle turns up into the sight line when the bolt is opened, the M1917 bolt never enters it because of its peculiar shape. When the M1917 bolt is opened, the hand is still in a natural and comfortable position, able to work the bolt with speed. Because of the position of the bolt handle, the British way of using rapid fire is entirely practical—this is to grip bolt handle, or knob rather, between thumb and forefinger, and retain the grip on it all the time during firing, pulling the trigger with the second, not the first finger. A little practice, and the soldier can make the rifle fairly sing by this little trick.

In the new M1917, still almost unknown to the American people, we have the fastest bolt-action rifle in the world, outside only of the Ross straight pull of Canada, which proved unsatisfactory in the mud of the trenches. With its fine-peep rear sight, like the rear sight of the big-game rifle of the sportsman, and the fast bolt, the new rifle is the most efficient man-killer of any army now engaged in war.

Wherefore, in spite of the bayonet superiority of the Hun rifle, and in spite of the better stock, and in spite of the higher velocity of the German bullet, our new rifle makes two bullets fly where but one bullet had flown before—and bullets are what are going to end this war.

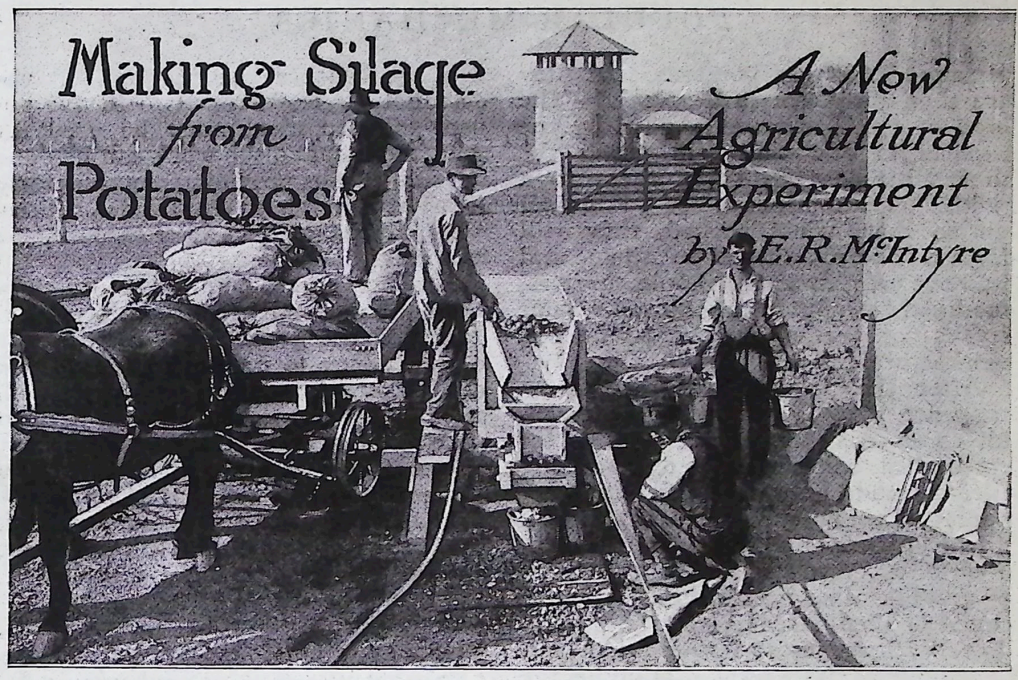
TRACTOR CROSSES SHALLOW STREAM WITH PERFECT EASE

THE time was, and not so many years ago either, when farm tractors did not appear at their best when attempting to ford streams. This picture, however, shows a stanch little machine, with a loaded hayrack in tow, making a crossing with less splatter and fuss than would be expected of a draft team. It may truly be said that a throbbing engine, rather than a puffing horse, is becoming the modern symbol of progressive farming. Good tractors are being built for service, and that means fording streams as well as plowing fields.

Making Silage from Potatoes

A New Agricultural Experiment

by E. R. McIntyre



Apple Graters, with Rows of Blunt Spikes Substituted for the Knives, Worked Well in Crushing the Potatoes. What is Desired Is a Juice-Filled Pulp That will Pack Solidly without Air Spaces

THREATENED with the chances of the corn crop taking a slump this year, and with the lesson of the past season's oversupply of potatoes still keenly remembered, the scientists of the government and state agricultural bureaus are busy testing the advantages of potato silage.

It is estimated that with an average yield, some 10 to 12 million bushels of potatoes are lost each year by rotting. Besides these huge losses from worthless culls, there is a likelihood of an annual surplus of potatoes beyond what are needed for human consumption. This last was true during the past winter and early spring. Wisconsin alone had 19,000,000 bu. of potatoes held back at loading points because of car shortage and poor demand. Much of this supply rotted, some of it was dumped on the fields, and but a small part reached live stock as cooked tubers.

As the Potato Pulp is Placed in a Silo, Approximately Two Per Cent of Corn Meal is Added. The Silage has Proved Satisfactory for Cows

Now the scientists come along and show the farmer how palatable potato silage can help to solve the problem. Commercial white or yellow corn meal, preferably new corn meal, when used to inoculate the chopped tubers, will do the work successfully.

All dirt is first

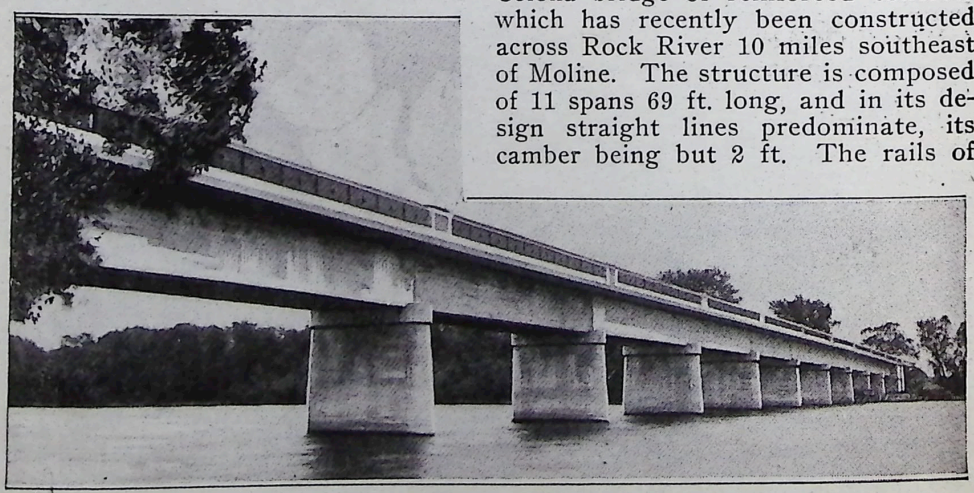
removed from the potatoes, and they are then run through a grinder. The type of machine recommended by the experts is one that will crush the tubers rather than grind them to a pulp. The potatoes must be broken up so that, when packed, they will form a solid mass filled with juice and without air spaces. Apple graters, modified by substituting rows of blunt spikes for the regular grater knives, worked well in the trials.

After the potatoes are ground up they are placed in water-tight receptacles or tanks, about two per cent of corn meal being sprinkled in among the ground potatoes, as they are poured in. This mixture is tamped down securely and the whole is covered with straw, cornstalks, or leaves, to a depth of several inches. A board cover is then fitted on and weighted down with stones so fermentation will be complete. The fermentation begins at once, and if the weather is warm gas bubbles will appear in 24 hours. Considerable pressure is developed and added weights must be put on from time to time. After two or three days the fermentation stops and the mass starts to settle. The process will not be complete in less than three weeks, as a rule, although in very warm weather it might not exceed 10 days. If reasonable care is used, losses from spoilage should be negligible, the scientists state. From two to five per cent of corn meal must be used for good results, and the work can be done upon any scale, providing the receptacle is tight enough to retain the juices. Vats, tanks, or concrete silos would be all right.

Feeding experiments have already been carried on with potato silage. Last fall the government fed 10 tons of this silage to pigs and cattle. The cattle were fed over a 60-day period, running potato silage in comparison with corn silage. It was found that potato and corn silage had about the same value. The amount of milk produced, the amount of weight gained, and the quality of the milk were about the same for each lot. In hog feeding, however, the potato silage only maintained the weight of the animals. This was to be looked for because the potato silage is high in carbohydrates and low in protein. The trials indicated that potato silage should be worth $25 a ton, or $1.25 per 100 lb., when corn meal is $1.50 a bushel.

LONG HIGHWAY BRIDGE OF CONCRETE

A notable feature of highway improvement in Illinois is the $62,000 Colona bridge of reinforced concrete which has recently been constructed across Rock River 10 miles southeast of Moline. The structure is composed of 11 spans 69 ft. long, and in its design straight lines predominate, its camber being but 2 ft. The rails of

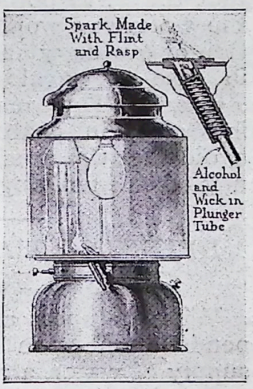


An Unusually Fine Example of a Highway Bridge of Reinforced Concrete: It Spans Rock River 10 Miles Southeast of Moline, Illinois, and Cost $62,000, Exclusive of the Two Approaches

buff-colored brick produce a pleasing color effect. The bridge supplants a ferry which had been in operation 40 years and was one of the last carriers of its type in that part of the country.

SAFETY LIGHTER FOR GAS OR OIL LANTERNS

A safety lighter for gas, or oil, lanterns is a recent invention which makes the use of matches unnecessary and can be operated regardless of gusts of wind. It is housed in a tube, set diagonally in the plate supporting the glass chimney, and its upper end is covered with a hinged plate having an abrasive under surface. In the tube is a spring-held plunger to which a wick is attached that is supplied with oil from a small reservoir. When the plunger is thrust upward, a flint spur on its upper end rubs on the rough plate, producing a spark that lights the wick, which in turn lights the lantern.

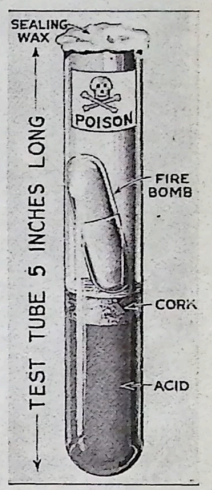


NEW GOCART IS EQUIPPED TO SLIDE DOWN STEPS

Mothers and nursemaids, particularly, will be interested in a new gocart that can be taken up and down steps and over curbs without jolting the youthful occupant. The special feature consists of light steel skids, pointed at either end, mounted next to the inner side of each wheel. They clear the ground by a short distance and permit the cart to slide over curbs and steps without bumps.

INCENDIARY BOMBS FOUND IN GRAIN FIELDS

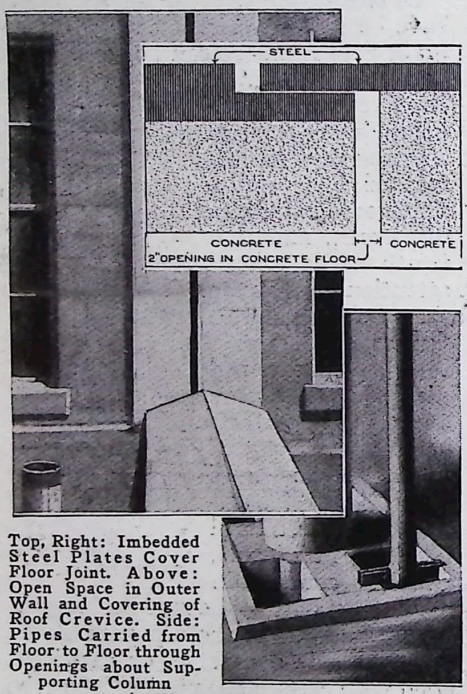
Of late a number of incendiary bombs have been discovered intact in western grain fields. There can be little doubt as to their origin. At any event, their accidental discovery, at a time when the effect of their explosion would have been disastrous, makes it worth while to call attention to them so that other possible finders of odd-looking, wax-capped glass vials may be on their guard. This particular variety of fire bomb consists of an ordinary laboratory test tube, a third filled with acid, which is confined in the bottom part of the receptacle by an internal cork. In the top part of the tube there is a capsule, or cartridge, filled with certain chemicals. The tube is sealed with wax. When the device is laid horizontally, the acid eats its way through the cork and comes in contact with the chemical in a 12-hour period. The resulting explosion throws fire over a wide area. It is an insidious contrivance, for it leaves no trace of itself following detonation. The device may be rendered harmless by promptly removing the capsule or draining the acid by breaking the bottom of the tube.



BROAD EXPANSION JOINTS ARE LEFT UNCALKED

Open expansion joints two inches in width have been provided in the walls, floors, and roofs of a group of reinforced-concrete buildings lately erected in a western city. Some provision is customarily made to compensate for expansion and contraction, but it is almost always the custom to fill the spaces with some plastic material. To bridge the gaps left in the floors, steel

plates have been imbedded in the concrete. This is at least an unusual if not altogether original plan. At the



Top, Right: Imbedded Steel Plates Cover Floor Joint. Above: Open Space in Outer Wall and Covering of Roof Crevice. Side: Pipes Carried from Floor to Floor through Openings about Supporting Column

roof the cracks are covered in a careful and thoroughly weatherproof manner.

FRENCH PERFECT NEW OIL FOR WATERPROOFING

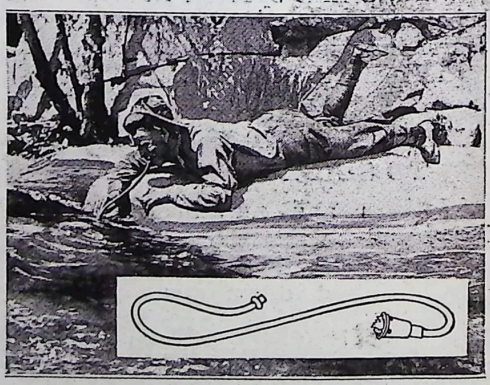
In France a new waterproof oil, which has many uses, is being prepared by mixing 100 parts castor oil with 200 parts amyl acetate, into which is stirred 25 parts of sulphur chloride. At first this composition jellies and gives off hydrochloric acid, but, on being kept tightly covered for several days, it becomes a liquid. It remains to neutralize the acid with barium carbonate and to filter the liquid. The final product is a colorless solution which can be used to waterproof cloth, leather, paper, etc. A resistant varnish can be made by adding alcohol, or benzine, to the liquid and dissolving the proper amount of nitrocellulose in it.

GOVERNMENT MAY PURCHASE CAPE COD CANAL

The Cape Cod Canal, a privately promoted improvement that shortens the water route between Boston and ports to the south by about 70 miles, may be purchased by the government. Army engineers have been engaged in appraising its structural value and its strategic worth with a view to its purchase. It is thought not improbable that they will point out how valuable the waterway would be in the protection of our navy and coastwise vessels in case of naval conflict near New England. The canal is of special service, also, in enabling navigators to avoid the trip around the cape, a journey often involving serious hazards.

DRINKING TUBE IS WATER FILTER FOR OUTER

When campers and hunters are dependent on open streams for their supply of water, a rubber filter tube of recent introduction is convenient as a substitute for a drinking cup. The large end is filled with absorbent material. This removes particles of foreign mat-

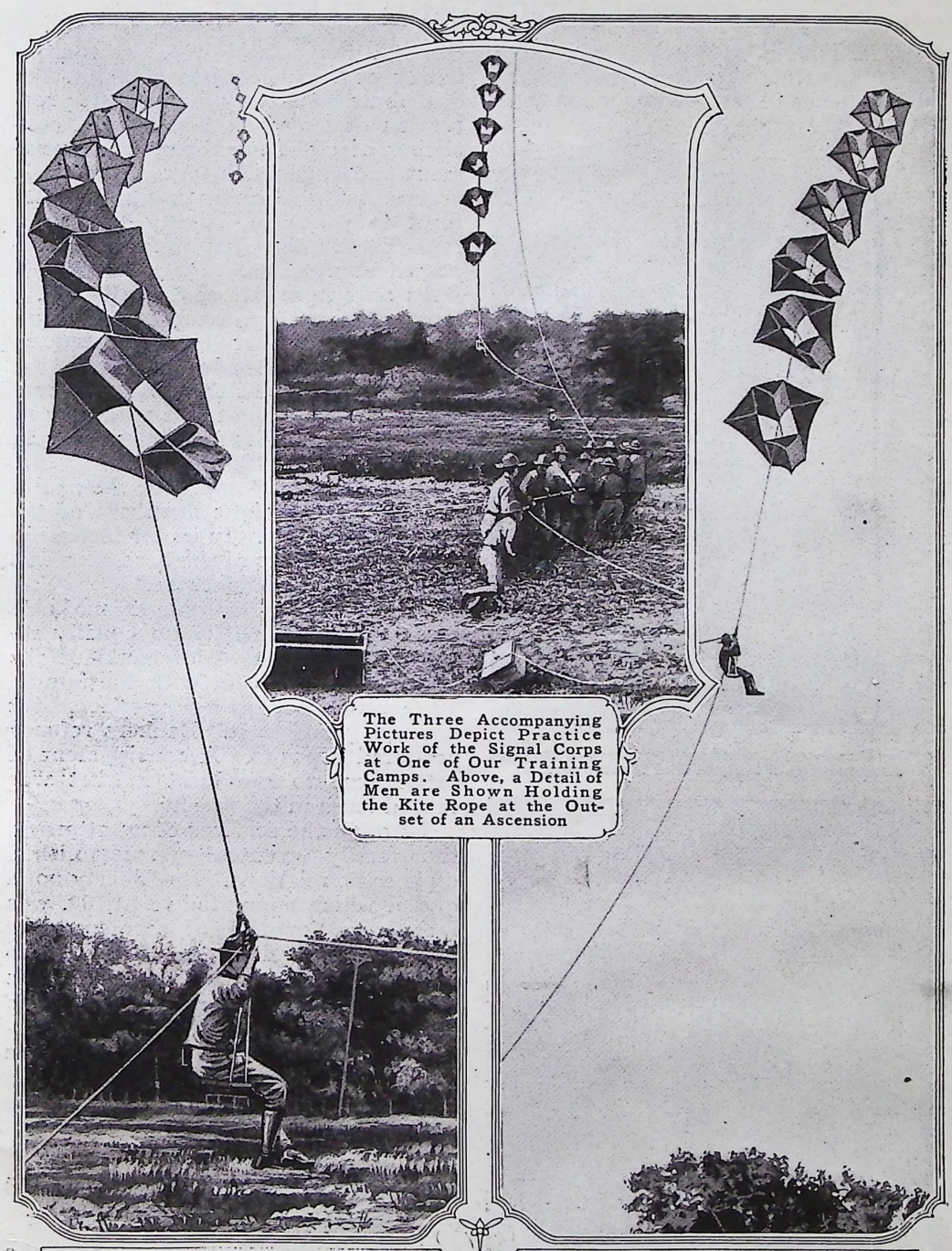


The Material in the Lower End of the Tube Filters the Water as It is Drawn into the Mouth

ter from the water as it is drawn into the mouth. The tube may be carried in a coat pocket.

¶A red flag with a white triangle is the new distinguishing emblem for veterinary surgical stations.

STRING OF KITES CARRY ARMY OBSERVER ALOFT



The Three Accompanying Pictures Depict Practice Work of the Signal Corps at One of Our Training Camps. Above, a Detail of Men are Shown Holding the Kite Rope at the Outset of an Ascension

First a String of Pilot Kites are Sent Up Several Thousand Feet to Get the Upper Air Currents. Then the Lifting Kites, Here Shown, are Attached to the Line, and Buoyed by Both, the Observer is Carried Aloft

Above the Trees and Going Up: A Signal Corps Officer with Work in Hand. The Kites Vary from 9 to 12 Feet in Length and are Held by a Three-Quarter-Inch Manila Rope. They are Made of Spruce and Canvas

PHOTOS COPYRIGHT, INTERNATIONAL FILM SERVICE

SLACKER MONUMENT RAZED BY WAR-SERVICE CONTRIBUTION AND PLEDGE

QUITE an extraordinary situation was precipitated in a small Iowa community recently through the refusal of a prosperous family of "conscientious objectors" to contribute aid in any form to the prosecution of the war. The family, consisting of eight members, is a prominent one engaged in agriculture, and aroused indignation by its steadfast refusal to purchase Liberty bonds, or subscribe to the Red Cross after repeated approaches.

Slacker Monument Erected by Townsmen of an Iowa Community to Family of War Nonsupporters

When the Family Agreed to Erect a 90-Foot Flagpole in Its Place, the Townspeople Burned the Monument

As an outgrowth of this attitude, a monument, perhaps one of the strangest that has ever been erected in America, was raised in the heart of the business district of the town. It was about 8 ft. in height and painted yellow. On each of its four sides, beneath the inscription: "Dedicated to C .... County Slackers," appeared the names of each of the eight members of the ostracized family. In larger letters on the different faces of the base, also was painted the word "slackers."

The unveiling of this remarkable shaft was followed by an equally remarkable boycott. Merchants of the town refused to deal with the family. They would neither buy products of it nor sell goods to it. Bankers refused proffered deposits. A consignment of cattle sent to the local market was turned loose in the streets.

Through the services of an attorney, the family eventually reëstablished diplomatic relations. Its Liberty bond quota, which amounted to $1,100, was met by a donation of corresponding size, to the Red Cross. A pledge to buy bonds and support the Red Cross in the future was also signed. When the family further agreed to erect a 90-ft. flagpole in the place occupied by the slacker monument, the townspeople, assembled at a meeting, ordered the shaft burned.

FRENCH ENGINEER PROPOSES GIBRALTAR TUNNEL

Again, after a lapse of 20 years, a French engineer has come forth with a proposal for the construction of a tunnel beneath the Straits of Gibraltar. The purpose of the proposed project is

to link the European and African railways and thereby give impetus to French and Spanish trade. It would give a direct line between Paris and Senegal, and make the trip from the French capital to St. Louis a matter of three days. Also, if connected with the Trans-African Railway, suggested by the British, it would make travel from London to the Cape a seven-day junket, providing that other perennial engineering dream, the Channel tunnel, were carried out. Owing to the depth of the water and the character of the underlying strata, it would be necessary to carry the bore to a depth of approximately 2,800 ft. Engineers seem to agree, however, that no overwhelming obstacles stand in the path of successful execution of the scheme. Preliminary estimates place the probable cost of the enterprise at $50,000,000, with an additional $20,000,000 for port improvements.

WHAT DAYLIGHT SAVING HAS ACCOMPLISHED

By JOHN ANSON FORD

IN a single day the personal habits of 100,000,000 people were radically changed by the passing of the daylight-saving law, and that change has greatly benefited the nation's health, promoted gardening on an unprecedented scale, and has conserved great quantities of fuel through the use of less artificial light. Householders have been among those who have enjoyed the most marked reduction in lighting bills.

An Illinois county seat in which are 891 meters, installed in homes and small stores, furnishes figures which probably can be taken as typical of thousands of American communities. In April, 1917, the current used was 23,606 kw.-hr., and in April, 1918, 21,942 kw.-hr., making a saving of 1,664 kw.-hr. The consumption for May last year and this year was 21,672 kw.-hr. and 19,934 kw.-hr., respectively, making a slightly larger decrease than for April, while in June, preliminary estimates showed, the saving in lighting current would be very much greater. In the plant supplying this town, approximately 3½ lb. of Illinois coal is consumed in making 1 kw.-hr. of electricity. Estimating the average monthly saving of the community at 1,800 kw.-hr., an added hour of daylight for seven months theoretically will effect a saving of more than 22 tons of coal. If, as seems altogether probable, thousands of other communities have made a similar record, the total saving is enormous.

In large office buildings the saving has been, and will be, small during the period of changed time because practically all the offices are empty before the hour of darkness arrives. On the other hand, clubs, hotels, etc., have experienced a saving in artificial light estimated at four or five per cent. In one nationally known hotel the daily average of current used during April, 1917, was 3,451 kw.-hr. as compared with 3,067 kw.-hr. in April, 1918, while the daily averages for May of last year and this were 3,330 kw.-hr. and 2,920 kw.-hr., respectively. As in other plants during these war times, a considerable part of the saving is not due to the change of time alone, but to greater care in using lights and to the installation of smaller lamps, etc. Making allowance for these factors, the daily saving in this hotel on account of the change of time will average as much as 170 kw.-hr. In the seven-month period theoretically this hotel will save 71 tons of coal, approximately four pounds of fuel being required to produce 1 kw.-hr. of current.

The saving to the county-seat residents, cited above, does not tell the whole story, for in every town there are many "minimum customers" in the summer—persons who must pay the minimum charge even though they use less current than that amount pays for.

In the case of a public-service company in a Missouri city of 25,000, 60 to 65 per cent of the residence current users are minimum customers during the summer. Obviously the new time schedule does not reduce their light bills. Theoretically the light company makes extra profit, though actually the gain is not large.

In this city the total revenue from 100 commercial customers, picked at random from various businesses, shows a very slight increase in May, 1918, over May, 1917. Apparently the customers have lost by the change in time, but the real explanation—which applies to hundreds of other cities and indicates how complex the whole question is—lies in the fact that the lighting company had spent much time and money in getting these 100 concerns to use better equipment, more window displays, more electric signs, etc. Normally the company's revenue in 1918 would have increased 10 or 15 per cent. It is easy to understand why the company claims that it has not profited by the change in time. The new schedule is of very little aid in "flattening out" the peak of the load, as some advocates of the change had predicted, for in the summer the peak does not come until most of the business houses are closed. As a rule the same number of boilers have to be kept on the line as formerly, and so the company experiences practically no saving in labor or fuel.

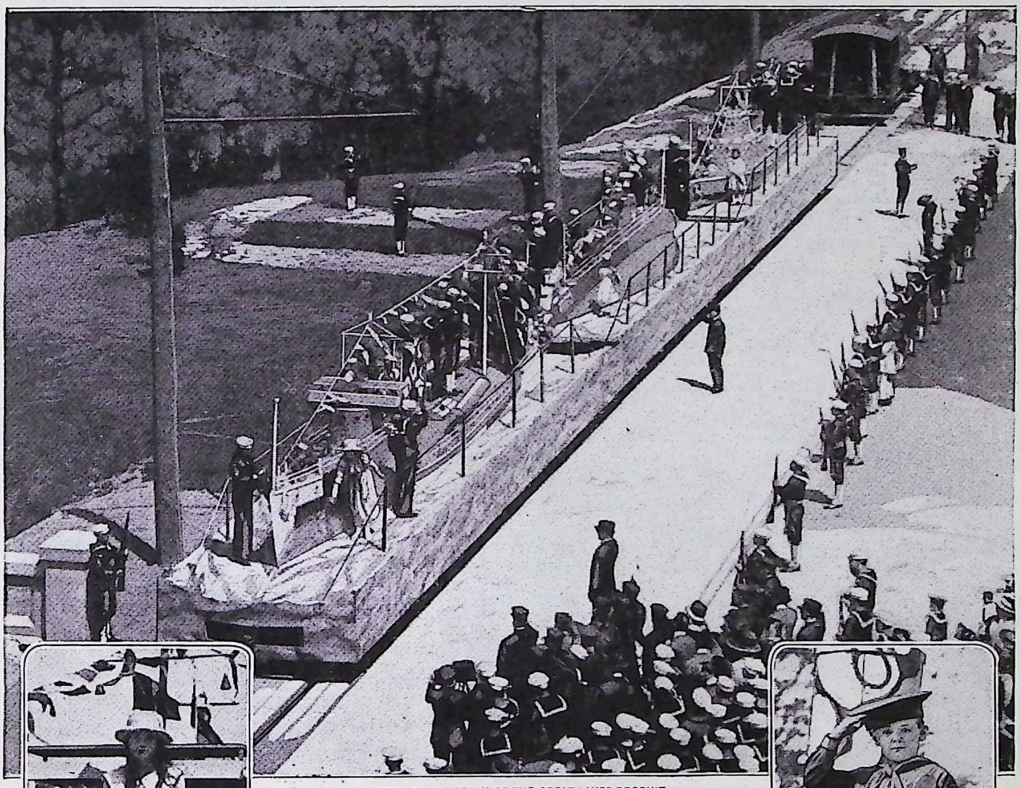
The chief executive of a large group of public-utility companies which normally spend $50,000,000 a year on extensions and improvements, estimates that the new time schedule has caused a three or four-per-cent reduction in the amount of lighting current supplied by his companies. What this would actually amount to in terms of coal was not stated. Early in the spring this public-utility expert advocated the adoption of the new time schedule for the entire year, believing that it would be a public benefit. The Fuel Administration has also argued for the extension of the plan to include the winter months. But more recently the expert referred to has changed his atttude, declaring that figures obtained from his engineers show such discrepancies that he is uncertain as to what benefit, if any, would result from a winter daylight-saving schedule.

The change of time has been a big factor in increasing gardening in towns and cities. Thousands of factory employes in industrial centers are able to raise produce for the first time. The bathing beaches, parks, and other outdoor recreation centers have had big increases in patronage. The head of the Chicago Health Department says that the present season shows a big decrease in disease in that city, and he attributes much of the improvement to daylight saving.

Movie men feared that the new schedule would hurt their evening business, but so far as can be learned it has not done so. An exception to this is the outdoor movie places, some of which have been handicapped by trying to exhibit in the daylight. In St. Louis, it is reported, nearly a score of these theaters have gone out of business or have been on the verge of doing so.

Farmers are proverbial early risers and many found the new arrangement disconcerting, especially to hired help. As heretofore, the hired man has risen at dawn but the natural inclination is to quit work at the usual hour by the clock, with the result that the farmer loses one hour of the man's labor. However, the farmers are adapting themselves to the new condition.

The consensus seems to be that as a fuel-saving measure, as well as from the standpoint of health and increased food production, the daylight-saving plan has been highly successful. Estimates given out by the Fuel Administration state that the plan will effect a saving in this country of 1,000,000 to 1,500,000 tons of coal. In Great Britain, where the plan was in force during only four and one-half months in 1916, the estimated saving that year was 260,000 tons of coal and 11,600 tons of fuel oil. In France, during the period of three and one-half months, the saving was 250,000 tons of fuel.



PHOTOS BY COURTESY OF THE GREAT LAKES RECRUIT

The Three Land-Going Recruiting Ships, a Destroyer, Submarine, and Chaser, are Shown Here at the Time of Their Christening. At the Bow of Each may be Seen a Girlish Sponsor with Bottle in Hand. A Close View of One of the Girls is Presented at the Left. At the Right, Saluting, Is the Mascot of the Fleet aboard the Destroyer

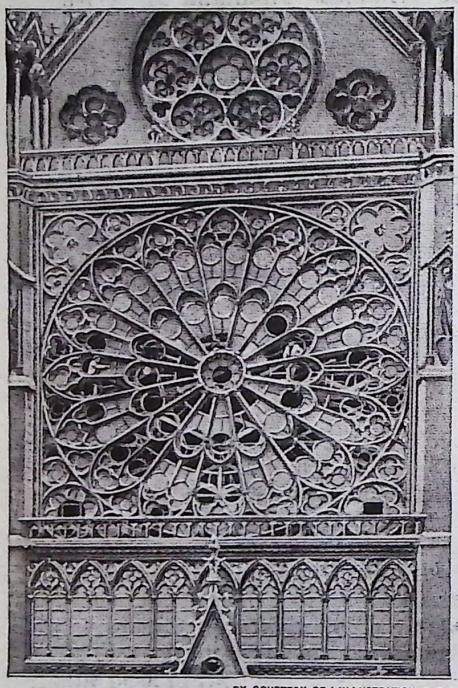
MID-WEST CITIES INVADED BY LAND-GOING FLEET

In charge of jackies of the Great Lakes Naval Training Station, a land-going fleet of three vessels has been "navigating" the Middle West to promote recruiting. The boats, each built on a separate flat car, consist of models of a destroyer, submarine, and chaser. Two of them are garishly camouflaged in riotous colors and futurist designs to aid visibility rather than conceal it. All of the boats mount guns, and a full-sized torpedo is carried on the deck of the submarine. The ship cars and two standard coaches, one used by the personnel and the other by examining physicians, compose the recruiting train.

FRENCH PROTECT WINDOWS WITH PAPER STRIPS

An interesting by-product of repeated air raids on Paris is the pasting of paper strips across the plate-glass windows to prevent the flying of glass fragments in case the panes are shat-

tered. These strips may also strengthen the glass somewhat. With characteristic French cleverness the Parisians



BY COURTESY OF L'ILLUSTRATION, PARIS

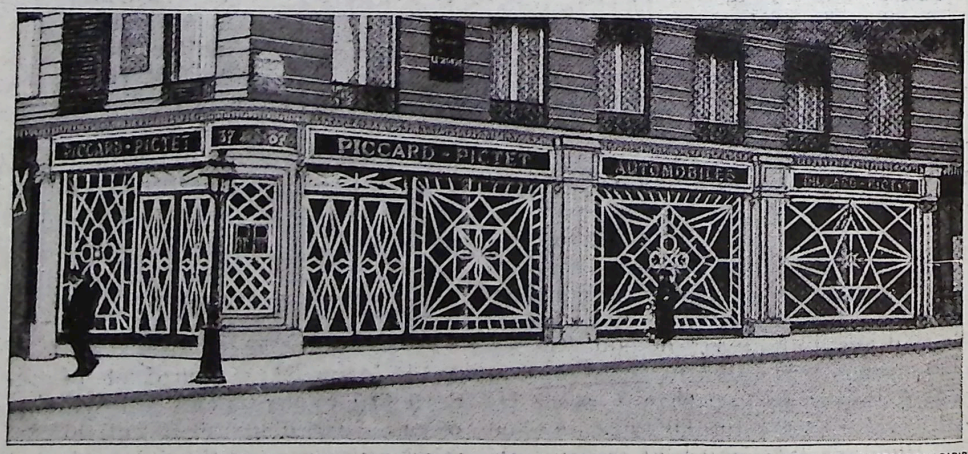
Removing the Priceless Stained Glass from a Rose Window in Notre Dame to Prevent Its Destruction by Exploding Shells or Bombs

have transformed the onerous war-time task into a fine art, the strips being used to make all sorts of pleasing geometric designs, to which are sometimes added conventionalized figures that advertise the shopkeeper's business. In the churches having priceless stained-glass windows the panes have been carefully removed.

FINE BREAD MADE DIRECT FROM WHEAT GRAINS

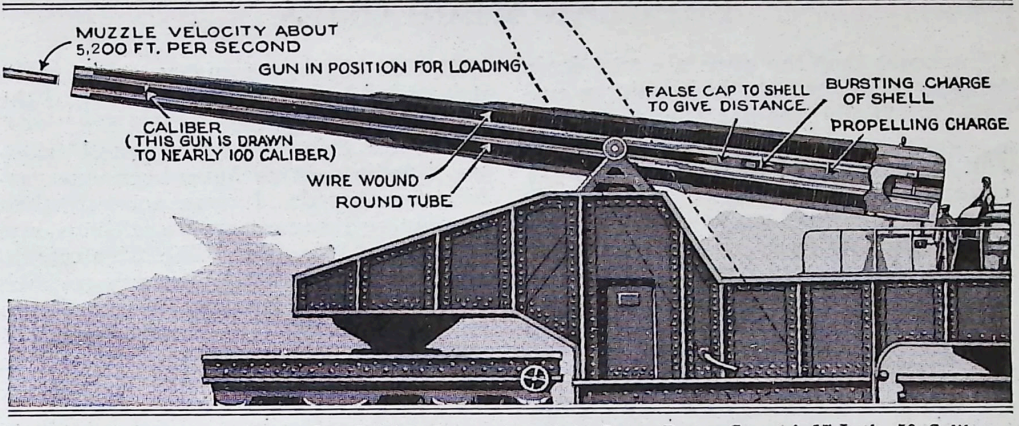
A rapid method of making what is described as perfect bread direct from wheat grains was recently explained in detail at a meeting of medical men in France. The grain is taken just as gathered and cleaned thoroughly, after which it is softened in water at a temperature of 50° until it is completely saturated. The presence of a trace of alcoholic yeast at this stage prevents any harmful secondary fermentation. The next step is to separate the pulp from the bran by crushing the grains between grooved cylinders and forcing the pulp through a metal-drum sieve. The paste prepared in this way contains the required amount of water for bread making, and all that is needed is to add the usual amount of yeast.

¶A torpedo-boat destroyer, the "Tarbell," recently launched at Philadelphia, is regarded as one of the fastest boats afloat, the guaranteed speed of the vessel being 46 miles an hour with a normal displacement of 1,200 tons.

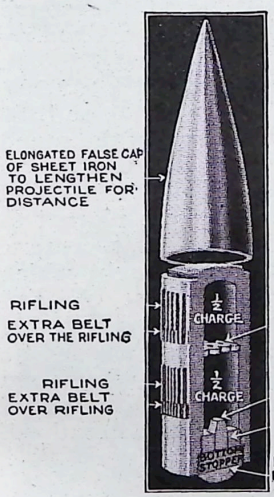


BY COURTESY OF L'ILLUSTRATION, PARIS

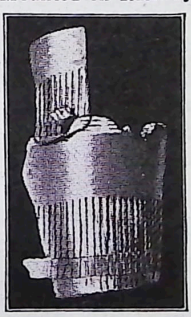
Artistic Safeguards against the Effects of Air Raids: Each Pane of Glass has been Reinforced with Paper Strips Which will Prevent the Flying of Fragments in Case the Glass is Shattered



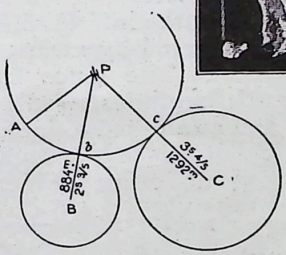
One British Conception of the Long-Range Gun: A 17-Inch, 50-Caliber Piece, with an 8.2-Inch Inner Tube, 110 Calibers Long, Inserted in It. French Authorities Feel Sure, However, That the Weapon is Not Mounted on Railway Trucks as Shown Here



The Drawing at the Left Shows the Character of the Shell That is Used. Interesting Features Are the Diaphragm and False Nose



Two Shell Fragments, Which Bear Out the Assumptions Made Concerning the Nature of the Projectile as a Whole, are Shown at the Right and Left



The Diagram Illustrates the Method of Sound Triangulation. The Distances Given in Meters Correspond to 2,860 and 4,180 Feet, Respectively

FROM THE SPHERE, LONDON. COPYRIGHT IN THE UNITED STATES BY NEW YORK HERALD COMPANY

MORE CONCERNING GERMAN LONG-RANGE GUNS

SOME interesting light has been thrown on Germany's long-range guns of late by study of shell fragments picked up in Paris. It appears that the projectile proper has a length of about 20 in. and is 8.2 in. in diameter. It weighs at the utmost 220 lb. and contains from 17 to about 19 lb. of explosive. At two points it is rifled and bound by copper bands. There is an interior diaphragm, with a central and three eccentric perforations, that divides the inside into two compartments so that two explosions, one following the other by a few seconds, occur. The shell is fitted with a false, tapered cap made of sheet metal. The length of this, and therefore the total length of the projectile, has not been determined.

It seems that originally there were three guns in use, but one of them burst, or was destroyed by French artillery fire, April 8, last. This statement is corroborated by the correspondent of a German paper, who further states that one of the pieces "looks more like an enormous gray crane than a real gun, and can throw a shell a distance of 80.7 miles." The same writer states that the shells reach Paris 183 seconds after being fired.

From Paris the additional informa-

tion comes that the guns are 98.4 ft. in length. The breech, it is said, measures 32.8 ft. and the barrel 65.6 ft. The guns are placed at the edge of a wood and camouflaged with a trelliswork covered with branches. They are mounted on fixed concrete bases, instead of on railway trucks, and were carried to their emplacement on a railway spur from Laon to La Fère.

This track, it seems, had attracted the attention of allied airmen since October last year. During the month of February last, the Huns established anti-aircraft batteries around the present emplacement and attempted to hold aerial scouts at bay. Of course, this served chiefly to increase French curiosity. Therefore, when shells "began falling in Paris, and it became evident that they were fired by long-range guns, the mystery was soon solved."

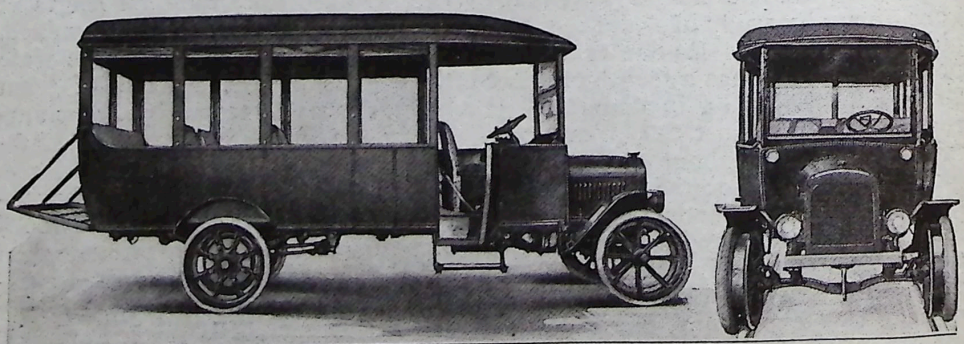
Contrary to the impression created by the latter statement, we have from another source the information that the guns were located by means of sound triangulation. The Huns had anticipated such methods would be employed, and attempted to interfere with the calculations by simultaneously discharging at other points massed batteries of large guns so as to make it impossible to identify the roar of the long-range weapons.

Despite this, however, sound triangulation is said to have been successfully employed. It was accomplished by placing three observers at the points of a large triangle. The first one to hear the report of the gun telegraphed the other two. Then by means of stop watches, the difference in the length of time taken by the sound waves in reaching the different stations was determined.

For instance: B heard the sound $2\frac{3}{5}$ sec., and C, $3\frac{4}{5}$ sec., after A had reported. Sound travels about 1,100 ft. a second. Therefore B was $2\frac{3}{5} \times 1{,}100$, or 2,860 ft., and C, $3\frac{4}{5} \times 1{,}100$, or 4,180 ft., farther from the source of the sound than A. With this information in hand, circles with radii of 2,860 ft. and 4,180 ft., respectively, were plotted to scale with B and C as their centers. Then a new circle was sought which passed through the point A and touched the other two circles at b and c. Extending the two radii Bb and Cc to intersection, the point P, the sound source and therefore the location of the gun emplacement, was determined.

WHEELS FOR RAIL AND ROAD USE EMPLOYED ON CAR

Interurban service between El Centro and Holtville, two small towns a few miles apart in the extreme southern part of California, is being maintained by a passenger-carrying motor bus built much like a street car. One of its interesting features is that the wheels are designed for both railways and highways. The inner half of each wheel is flanged to follow a

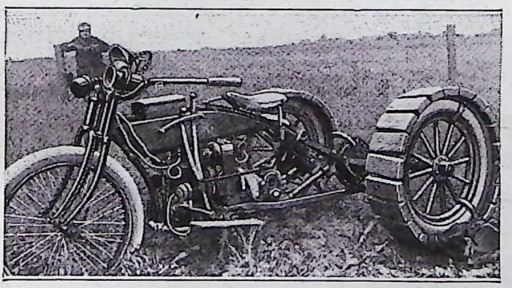


The Wheels are Built for Railways and Highways—an Odd Combination That is Seldom Seen. Like the Stage of Western Days, the Car is Equipped at the Rear with a Luggage Rack

steel rail. The outer half is equipped with an ordinary tire. The vehicle traverses street-car tracks in town, and highways in the country. It accommodates 17 passengers, exclusive of the driver.

MOTORCYCLE TRACTOR USED FOR FARM PLOWING

Now that farm-tractor attachments for the automobile are no longer novelties, the motorcycle farm tractor makes its appearance. Such a contrivance, built by fitting the rear wheels and transmission of an old motor car to the rear of a four-cylinder motorcycle, from which the driving wheel was removed, is in successful use. The gear ratio obtained causes the wheels to make one revolution to 20 revolutions of the motor. A fan mounted at the right side assists in cooling the engine and preventing overheating. Hardwood blocks bolted to strips of machine belting encircle the driving wheels, giving them adequate bearing surface for good traction. The machine handles a small gang plow with ease.



By Equipping a Motorcycle with the Rear Wheels and Transmission of an Old Automobile, a Hybrid Tractor That Does Satisfactory Work was Built

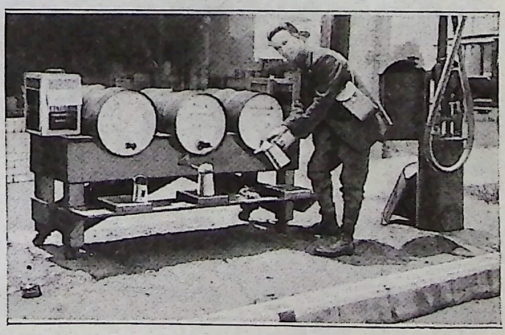
TANK CLEVERLY FEATURED IN STRAW-HAT DISPLAY

An armored tank, 9 ft. long, was the central feature in an exceptionally clever window display gotten up recently to advertise straw hats. The imitation of a fighting machine was provided with an endless creeper tread to which were attached two rows of straw hats that slowly traveled round and round the car. Added realism was imparted to the display by installing red bulbs, controlled by a flasher, in the imitation cannons that pointed menacingly from the side. In the foreground was an array of hats and samples of straw.

A Straw-Hat Display That Attracted Tremendous Attention: Two Rows of Hats are Attached to the Endless Creeper Tread That is Driven by a Small Motor

SALE OF MOTOR OIL PUSHED BY SELF-SERVICE SCHEME

One garage owner who appreciates the value of accommodating his patrons with dispatch, has made use of the self-service idea in promoting the sale of motor oils. At the curb line he maintains a movable rack that supports three barrels of lubricant, each labeled with the trade name and price of the product it contains. Passing motorists are permitted to wait on themselves, if attendants of the garage are occupied with other patrons. In addition to facilitating service, the scheme advertises the brands of oil carried in stock.



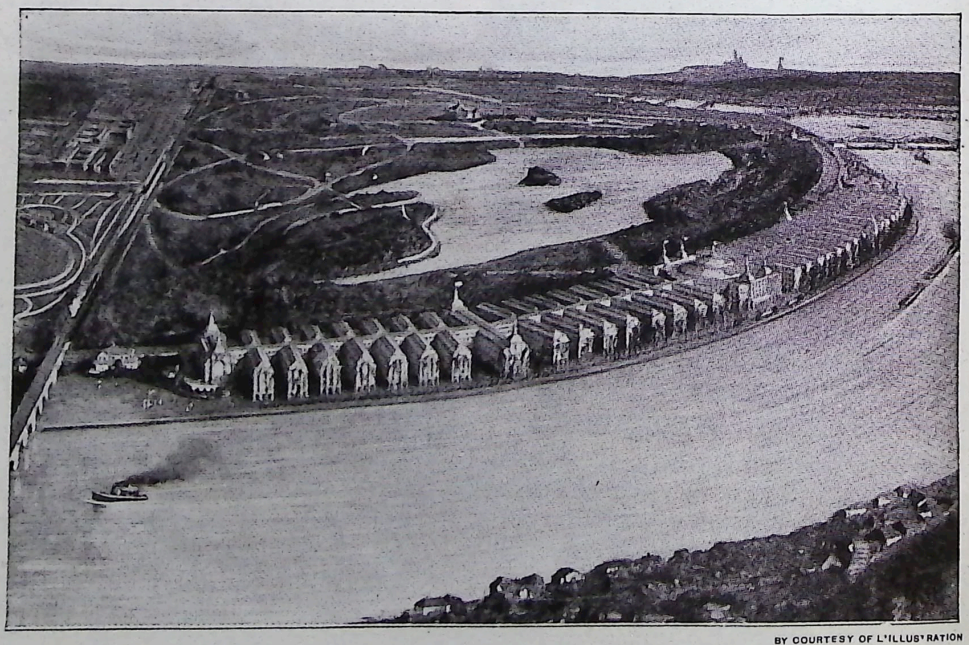
When the Garage Attendants are Engaged with Other Patrons, the Passing Motorist may Serve Himself and Avoid Loss of Time

PERMANENT EXHIBIT PALACE FOR LYON SAMPLES FAIR

Preliminary plans for the construction at Lyon, France, of a permanent exhibition palace for the international sample fair, have been announced. In contrast to the fate that has met the Leipzic fair, sales and attendance have steadily increased at Lyon despite the war. Up to the present the fair has been housed in simple buildings along one shore of the Rhone River and in small structures situated elsewhere. The inconvenience of this arrangement has caused the committee of the fair to lay plans for the erection of a $4,000,000 palace where all exhibits can be grouped in a relatively restricted area. It is to be situated on a bank of the Rhone adjacent to Golden Head Park and will cover a ground space of about 30 acres. It will comprise a number of separate galleries, or exhibition buildings, and will be built in a curve to conform to the character of the ground, which is skirted by a broad avenue. The upper two stories and the ground floor will contain some 4,000 booths, and the third floor will be occupied by the offices of the employes and exhibitors. In annexes will be installed the custom office, and warehouses directly connected with railway facilities. In as much as the gross income of the fair last year amounted to $240,000, the committee in charge has no fear as to the financial future of the undertaking.

SCIENTISTS VIEW ECLIPSE WITH UTMOST CARE

Not for 18 years have astronomers in this country had such a big day as on June 8 when the sun was eclipsed, and not for years to come will they and the public again have an opportunity to view such a remarkable phenomenon. While multitudes of people, dwelling in the diagonal path of the shadow that moved across the country that day, smoked bits of glass that they might watch the disappearance of the sun, astronomers at many points were preparing to study the occurrence scientifically. Typical of these activities were the preparations made at Simla, near Colorado Springs, where tempo-



BY COURTESY OF L'ILLUSTRATION

The Proposed Exhibition Palace for the Sample Fair at Lyon, France: The Ground Plan will Conform in Shape to the Contour of the Shore Line and a Broad Avenue will Extend along the Inner Curve of the Building

Astronomers Observing the Eclipse: To the Right in the Foreground Stands Professor F. H. Loud, the Only Survivor of the Scientists Who Studied the 1886 Eclipse from the Summit of Pike's Peak

The Progress of the Eclipse as Recorded by a Camera at Simla, Colorado

Temporary Shelters Erected at Simla, Colorado, for Instruments Used in Studying the Sun's Eclipse

rary shelters for many astronomical instruments were erected. Projecting from one of these structures, like a howitzer ready for action, was a slender wooden housing containing a 12-in. lens with which photographs of the eclipse were taken. Within the frame shelter, which was covered with building paper to keep out the light, the astronomers worked with the utmost concentration during the precious seconds of eclipse. In due time the deductions made by the observers will be made public.

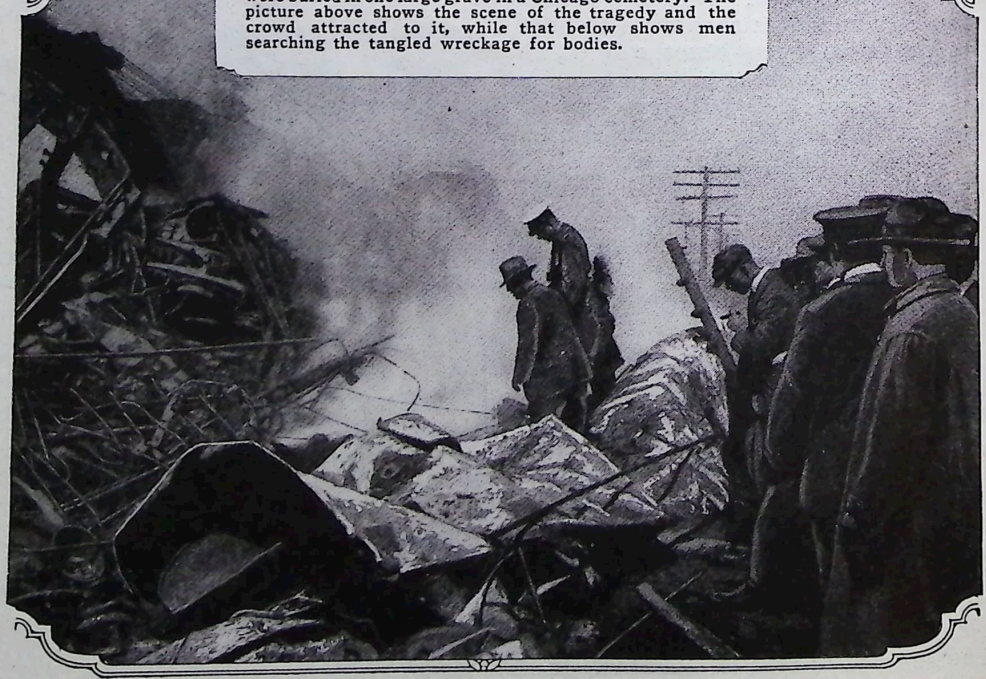
SAFETY-FIRST WASTE CAN AUTOMATIC FIRE GUARD

For general factory and garage use, a fire-preventing waste can has been developed. It is intended as a depository for waste matter that is subject to spontaneous combustion. Essentially it is a combination of a trash receptacle and a fire bucket. The base, which is the waste receiver, is provided with a large mouth. The lid fitting this closes automatically. The bottom of the container is supported three inches above the floor. On top of the waste can the covered fire bucket is mounted. In its bottom is a sprinkler valve with a fusible link that gives way when subjected to heat. Thus, should fire originate in the waste, the content of the bucket would automatically be sprayed on it. The contrivance is made of heavy sheet metal, and the fire bucket is so designed that it would not likely be used for purposes other than that for which it is intended.

Left: Waste Can Fully Assembled; Foreground, Fire Bucket with Sprinkler Valve, and at Top, Front and Phantom Interior Views of Receptacle

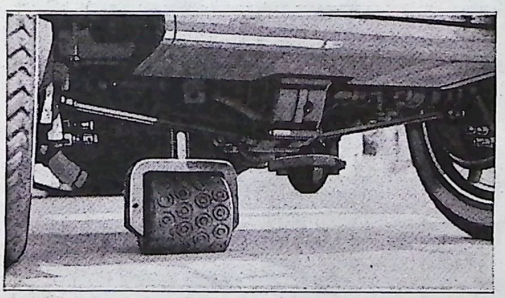
EMPTY TROOP TRAIN RUNS DOWN CIRCUS SPECIAL

ONE of the most serious railway disasters that has occurred in the Mid-West in recent years claimed the lives of from 53 to 60 or more circus performers and attachés when an empty troop train crashed into the rear of a show train near Gary, Ind., recently. Many men and women, pinned beneath the débris, were burned to death. Fifty-three bodies, charred beyond all hope of identification, were buried in one large grave in a Chicago cemetery. The picture above shows the scene of the tragedy and the crowd attracted to it, while that below shows men searching the tangled wreckage for bodies.



"FIFTH WHEEL" IS NONSKID BRAKE FOR AUTOMOBILE

To minimize the danger of skidding on wet pavements, an auxiliary brake has been developed for the motor car. In part it consists of a caster, or "fifth wheel," attached to the rear axle and arranged so that it may be lowered into contact with the roadway. A vacuum system is provided for its operation, but a hand lever can also be used. The device is intended to be held against the pavement when conditions make skidding imminent. The pressure it exerts may be regulated, regardless of the type of control employed. Application of greater pressure would be made should the car start to skid. The caster is equipped with springs that permit a



Showing the Rubber-Tired Antiskid Brake in Contact with the Pavement and the All-Steel Type in Raised Position

5½-in. compression, enabling it to pass ordinary obstructions. Both rubber and steel-tired casters have been used in experimental tests with analogous results. For use on muddy roads, a special disk is substituted for the "wheel."

VACUUM PIPE GLEANS BILLS IN RED CROSS CAMPAIGN

Vacuum gleaning money from street crowds was the striking scheme employed in one of the large cities some weeks ago for the benefit of the Red Cross. A suction pipe was held over the heads of persons congregated on the sidewalk, and contributions solicited by a leather-lunged seaman who shouted through a megaphone. Crisp dollar bills and worn greenbacks, it mattered not which, were drawn in by strong suction force when inserted in the muzzle of the tube. The novelty

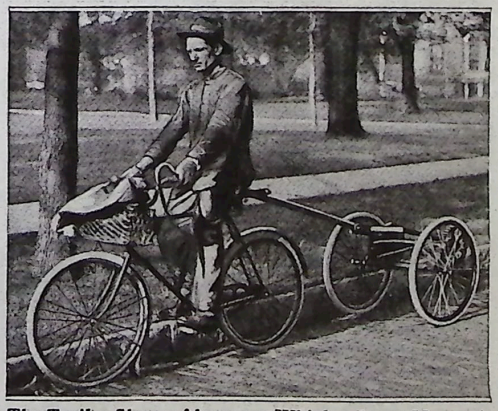
BY COURTESY OF SCREEN-TELEGRAM

Bills Placed in the Muzzle of the Tube were Drawn In by Strong Suction Force

of the plan attracted passers-by and drew forth many donations.

BICYCLE TRAILER CARRIES CARETAKER'S LAWN MOWER

A caretaker whose work included mowing several lawns, found that he was able to save much time in going from place to place by riding a bicycle and drawing his mower after him on a trailer. The latter consists of two bicycle wheels connected by an axle to which the cutting implement is securely clamped, while the handle of the mower is employed as a tongue,



The Trailer Shown Above, on Which a Lawn Mower is Mounted, Enabled the Caretaker Using the Device in Connection with His Bicycle, to Save Much Time in Going from Place to Place

being fastened to the seat of the bicycle.

YANKEE FIGHTERS ON THE HIGHWAY TO BERLIN

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General Pershing, Commander of the United States Overseas Fighting Forces, Giving a Group of Line Officers a Heart-to-Heart Talk Prior to Their Departure for the Front: Pershing's Words Are Few, but Their Meaning Unmistakably Clear

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A Child with a New Plaything could be No Prouder Than This Stalwart Jackie, Who is Taking a German Seaman from the Captured "U-53" along the Deck of a Destroyer

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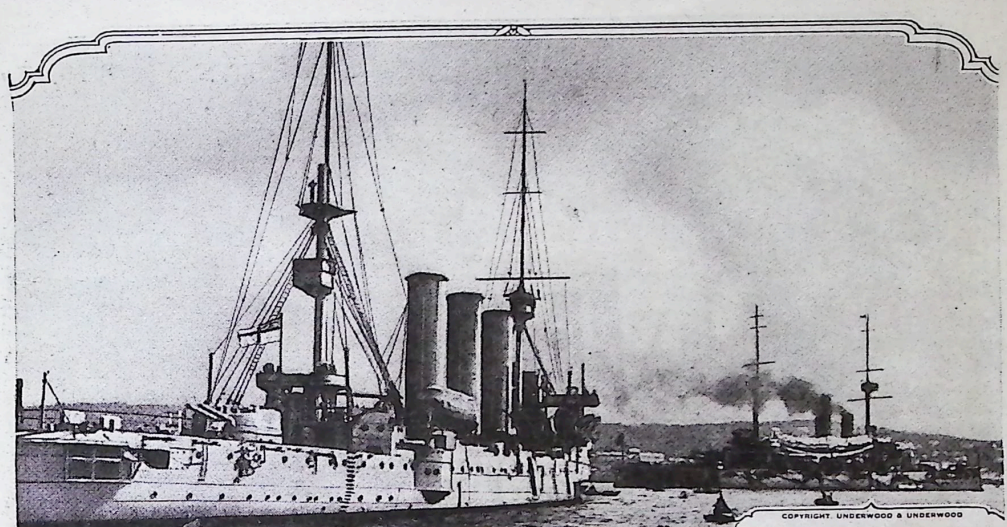
Yankee Troopers have Received Stirring Ovations in British and French Cities through Which They have Passed, but Fancy the Effect on a Gallant Group of American Boys Proceeding to the Front When Cheered along the Way by Little Tots Such as These, Who Cry "Vive l'Amerique" and Occasionally Strew Flowers in Their Path

HISTORY MADE AT ZEEBRUGGE AND VLADIVOSTOK



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Like the Shot at Sarajevo That Precipitated the World War, the Attempted Assassination of a Japanese Merchant at Vladivostok Caused the Landing of Japanese Marines from the Cruiser Pictured Above. The Incident Is Not Yet a Closed One

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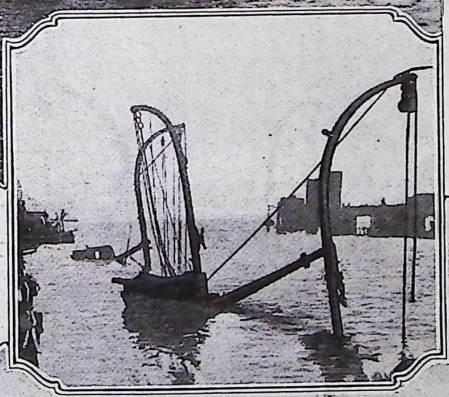
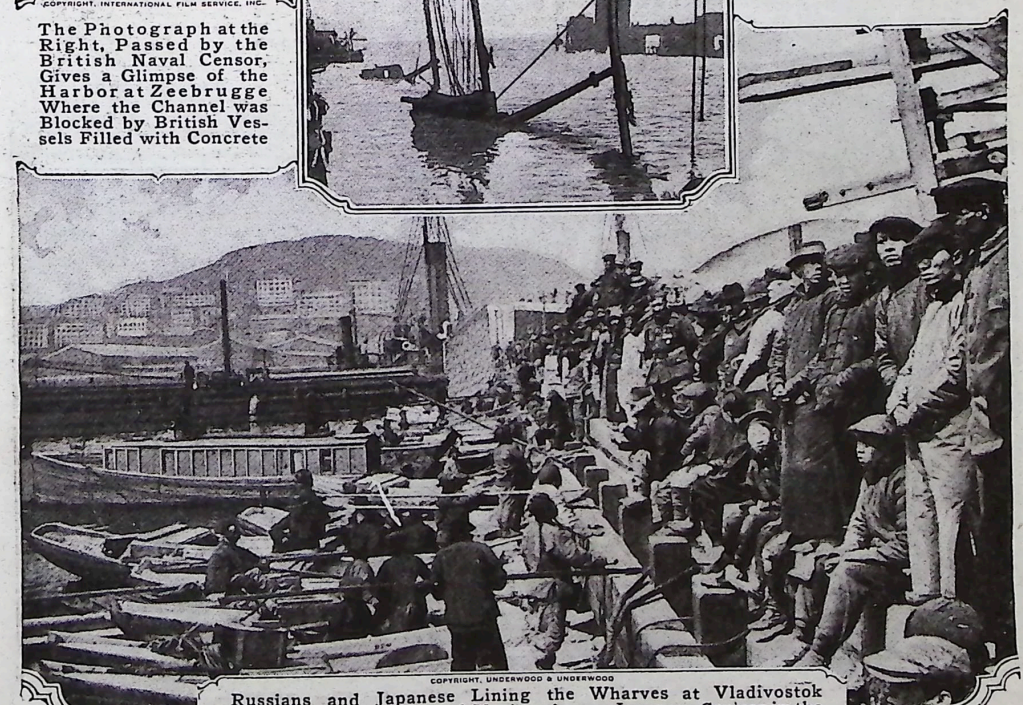
The Photograph at the Right, Passed by the British Naval Censor, Gives a Glimpse of the Harbor at Zeebrugge Where the Channel was Blocked by British Vessels Filled with Concrete





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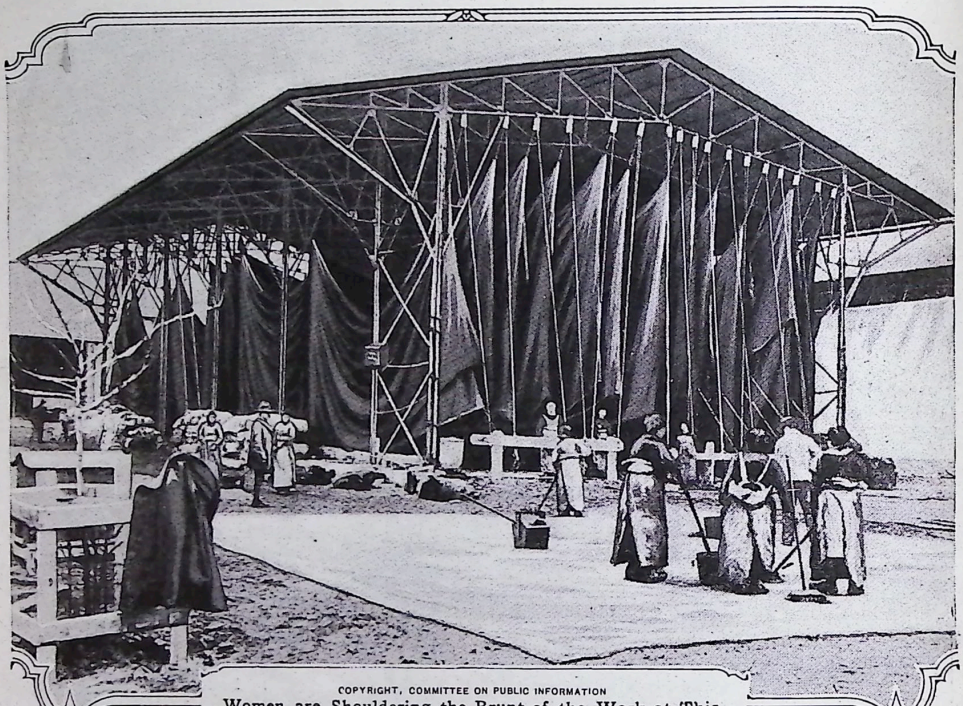
Russians and Japanese Lining the Wharves at Vladivostok Watching the Landing of Marines from a Japanese Cruiser in the Harbor: Incidentally the Russian Vessel Adjacent to the Japanese One in the Picture at the Top was Captured during the Russo-Japanese War and Later Returned

HOW FRENCH WOMEN BACK UP THEIR DEFENDERS



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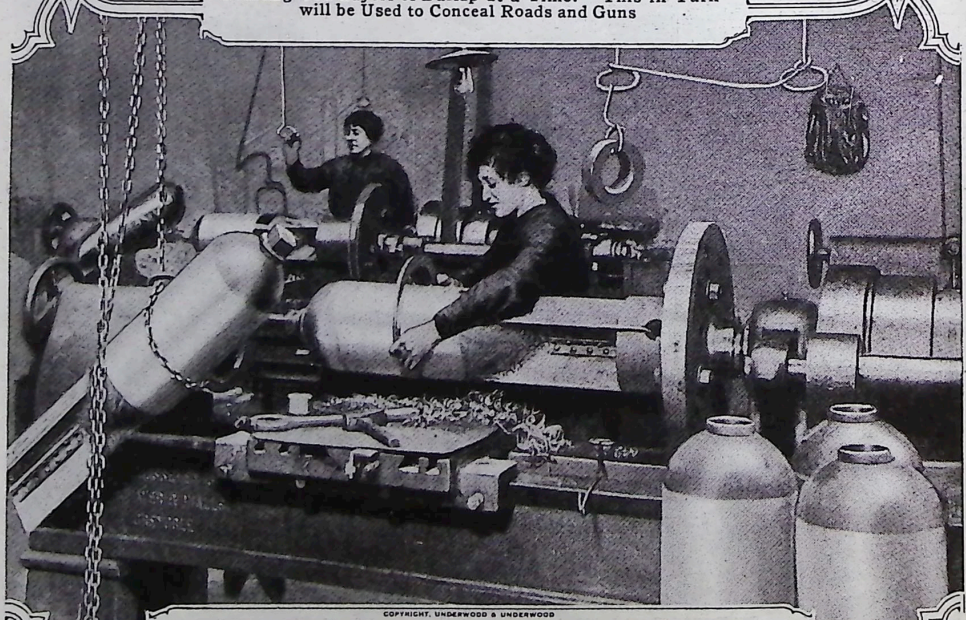
Women are Shouldering the Brunt of the Work at This Camouflage Plant in France, Where Various Materials for Use at the Front are Prepared. Here They are Shown Painting Ten Layers of Burlap at a Time. This in Turn will be Used to Conceal Roads and Guns



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France's Man Power Is in the Trenches Battling the Hun. Its Woman Power is being Utilized for the Production of Munitions, Supplies, and Food. These Women are Manufacturing the Deadly 9.6-Inch Aerial Bombs Which have been Used with Telling Effect by French Airmen

GERMAN U-BOATS OPERATE IN AMERICAN WATERS

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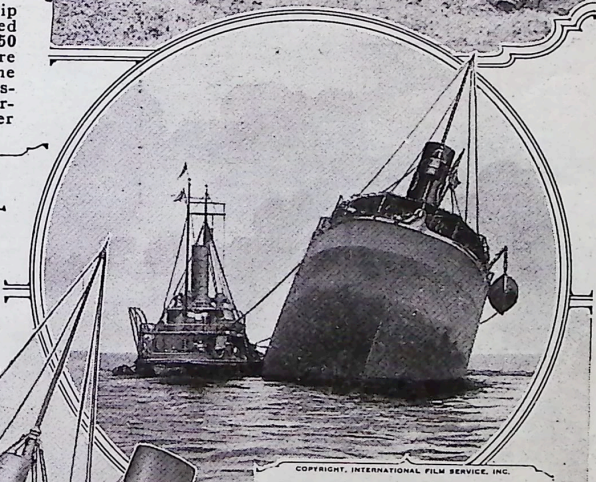
Surviving Crew of the Steamship "Winneconne," Which was Halted and Sunk by a Submarine Some 50 Miles off Cape May: The Men were Given Ample Time to Provision the Life Boats Before Bombs were Discharged aboard the Vessel. Formerly the Ship Was the "Hogland" under the Danish Flag



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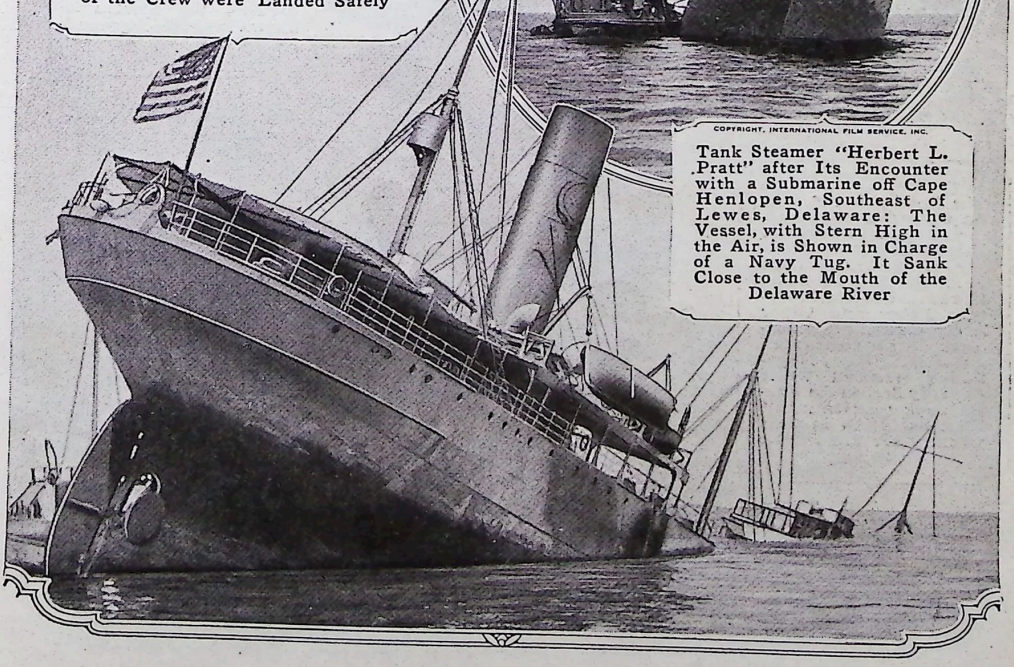
Close-Up Stern View of the "Herbert L. Pratt," Which, Because of Its Fortunate Position, in Only Seven Fathoms of Water, Engineers Believe can be Salvaged without Difficulty: All Members of the Crew were Landed Safely



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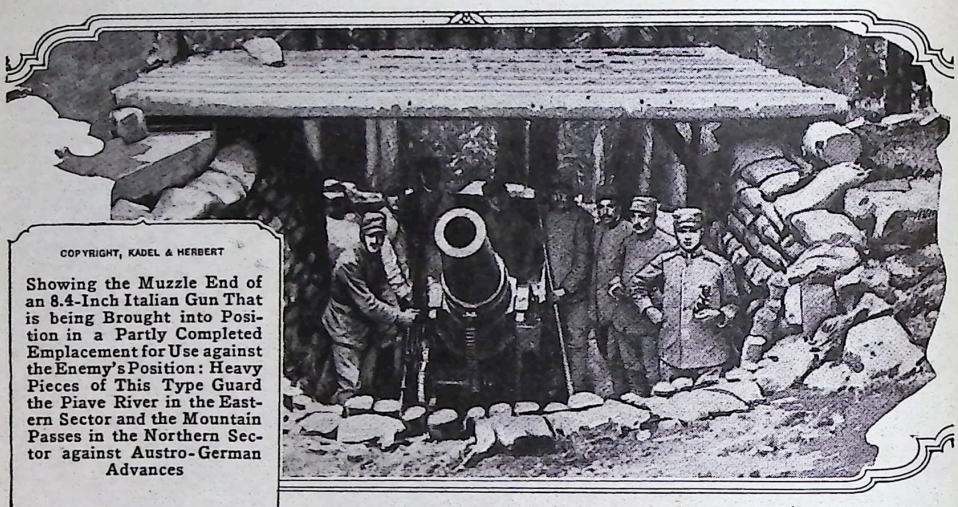
Tank Steamer "Herbert L. Pratt" after Its Encounter with a Submarine off Cape Henlopen, Southeast of Lewes, Delaware: The Vessel, with Stern High in the Air, is Shown in Charge of a Navy Tug. It Sank Close to the Mouth of the Delaware River



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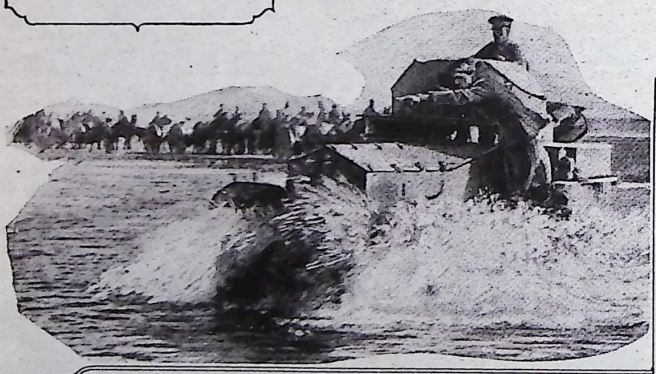
Showing the Muzzle End of an 8.4-Inch Italian Gun That is being Brought into Position in a Partly Completed Emplacement for Use against the Enemy's Position: Heavy Pieces of This Type Guard the Piave River in the Eastern Sector and the Mountain Passes in the Northern Sector against Austro-German Advances



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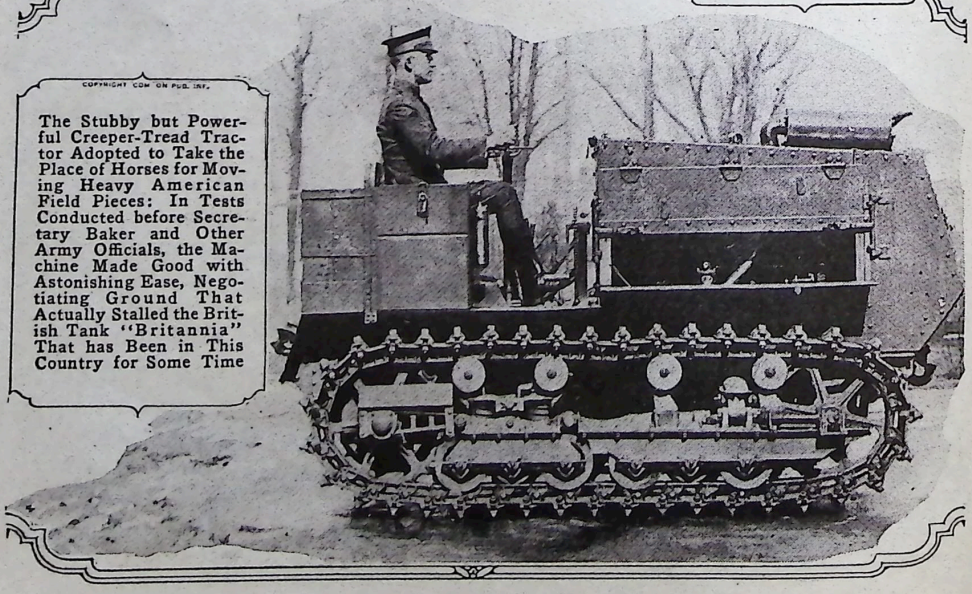
Introduction on the Western Front of Heavy Tank Cars has Caused Attention to be Diverted from the Smaller and Lighter Armored Motor Cars That have Been in Use Since the Beginning of the War. This Shows Such a Machine Plunging across the River Diala in Mesopotamia. British Artillery Ready to Ford the Stream is Shown in the Background



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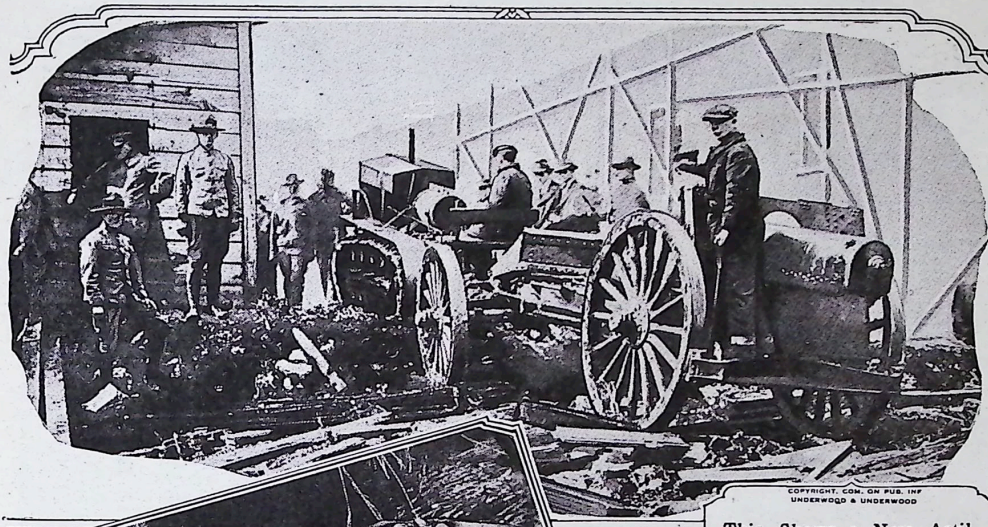
The Stubby but Powerful Creeper-Tread Tractor Adopted to Take the Place of Horses for Moving Heavy American Field Pieces: In Tests Conducted before Secretary Baker and Other Army Officials, the Machine Made Good with Astonishing Ease, Negotiating Ground That Actually Stalled the British Tank "Britannia" That has Been in This Country for Some Time



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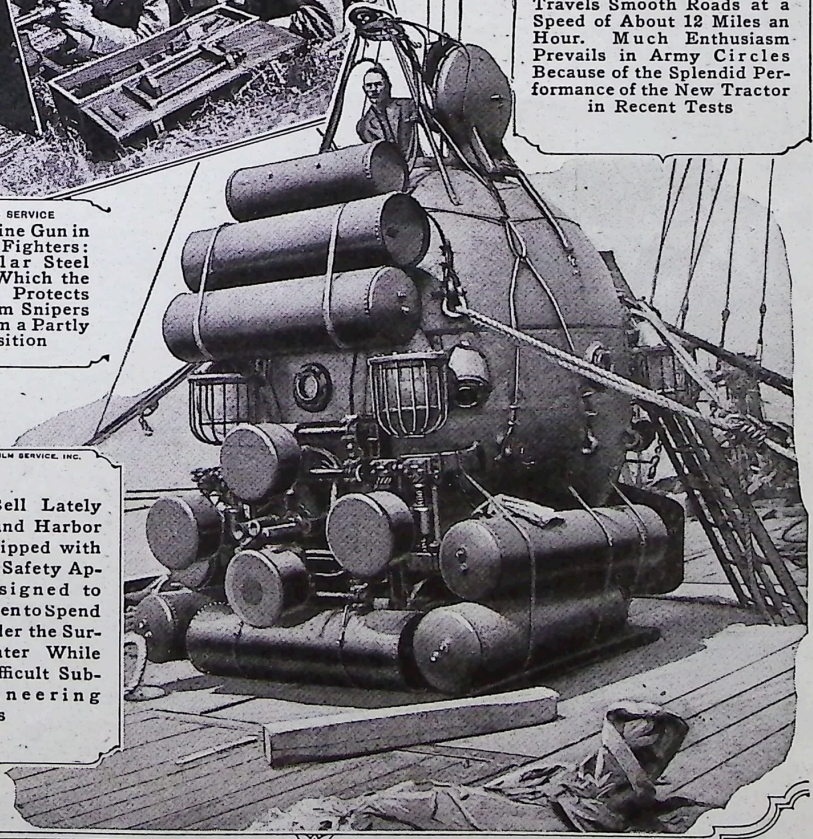
This Shows a New Artillery Tractor at Work Moving Field Ordnance over Rough Ground. In Addition to Climbing 45-Degree Grades under Load, the Machine Travels Smooth Roads at a Speed of About 12 Miles an Hour. Much Enthusiasm Prevails in Army Circles Because of the Splendid Performance of the New Tractor in Recent Tests

PHOTO BY GILLIAMS SERVICE

New Light Machine Gun in Use by Italian Fighters: The Rectangular Steel Plate, through Which the Barrel Projects, Protects the Operator from Snipers When Firing from a Partly Exposed Position



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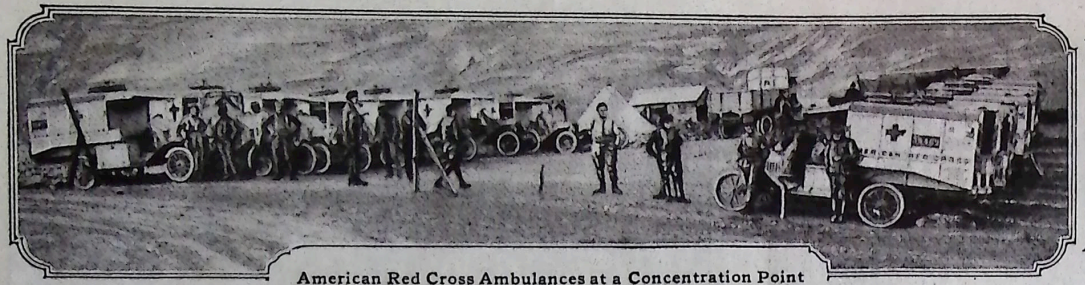
Large Diving Bell Lately Built for River and Harbor Work: It is Equipped with the Most Recent Safety Appliances and Designed to Enable Several Men to Spend Long Periods under the Surface of the Water While Carrying Out Difficult Subterranean Engineering Projects



American Red Cross Ambulances at a Concentration Point behind the Serbian Lines, Probably in Macedonia: Large Stations have been Established Where Food and Clothing are Provided for Destitute Refugees

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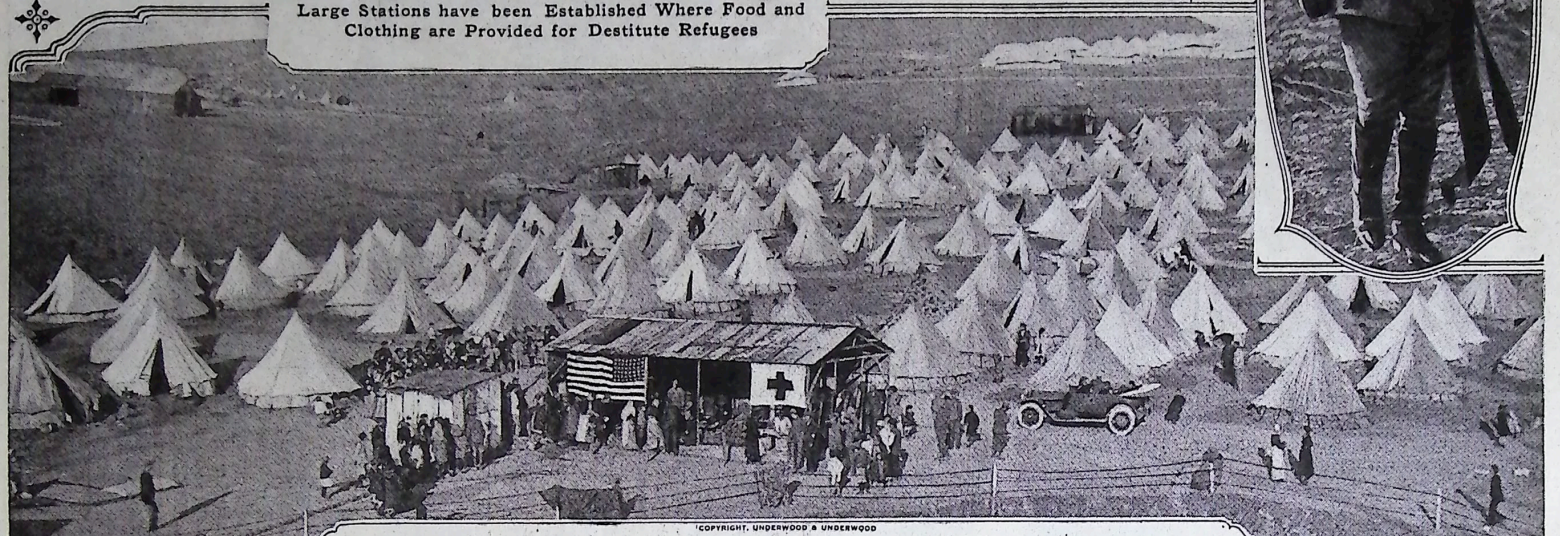
Officer with British Forces in Mesopotamia Reading a Message Dropped by an Aerial Dispatch Carrier: The Streamers Visible at the Right are Attached to the Receptacle in Which the Letter is Placed When Launched

BRITISH OFFICIAL PHOTO



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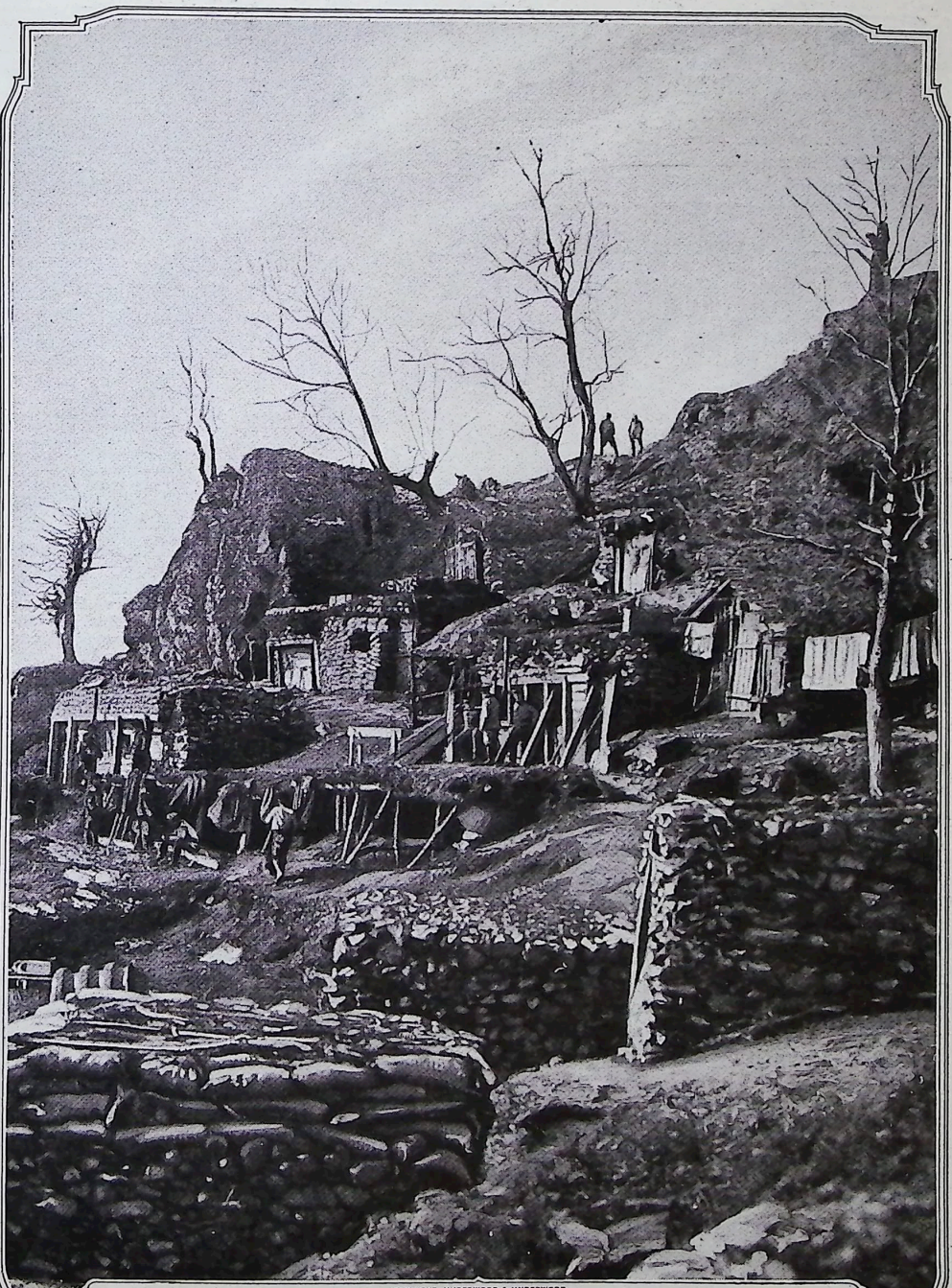
BRITISH ARMY AND AMERICAN RED CROSS IN BALKANS

While Attention is Focused on the Western Front, Much Work Demands Energy in the Balkan States. Some of the Activities There are Treated in the Pictures Presented Herewith. The Photograph Above Shows an American Red Cross Camp near Saloniki Where Refugees are Sheltered and Fed

SERB REGIMENTAL HEADQUARTERS IN BALKANS



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THIS group of bomb-proof dugouts on a hillside somewhere in the Balkans is a Serbian regimental headquarters. Although they have lost hold on their country and their king is without a throne, the gallant fighters of Serbia, reorganized and re-equipped by the allies and led by Prince Alexander, continue to harass the enemy.

HANDLING AMERICAN AND BRITISH WOUNDED

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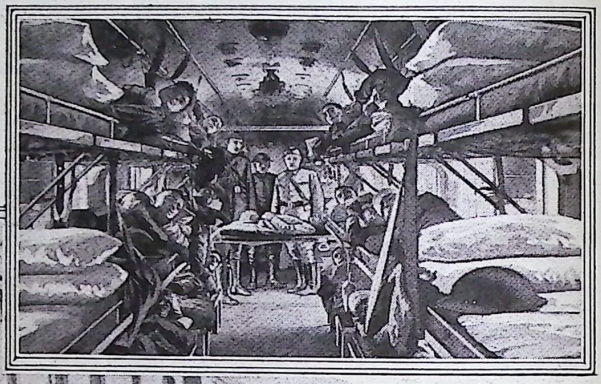

Interior View of an American Hospital Train in Service in France: The Picture Shows Wounded Soldiers on Their Way to One of the Base Hospitals. Officers of the United States Medical Corps Are in Attendance

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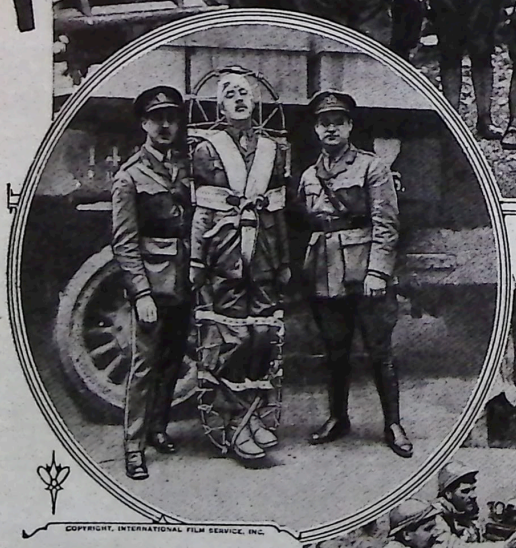
During the German Drive for Paris: Dispatching Wounded Americans to Base Hospitals. Apparently the Picture was Taken While a Train was being Loaded with Patients Delivered by Ambulances from Field Dressing Stations



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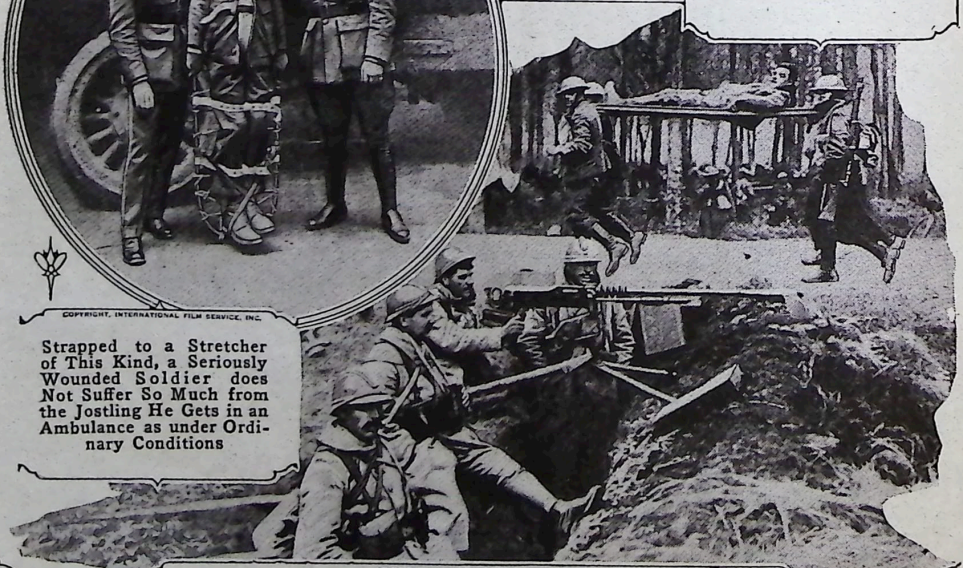
Strapped to a Stretcher of This Kind, a Seriously Wounded Soldier does Not Suffer So Much from the Jostling He Gets in an Ambulance as under Ordinary Conditions



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Wounded Tommy being Carried on the Shoulders of Four Comrades, Passing the French Lines on the Way from the British Advanced Positions to the Rear. From His Posture He Seems More Concerned with the Machine-Gun Emplacement He is Passing Than with the Pain He Undoubtedly is Suffering

BRITISH OFFICIAL PHOTO

DEFEATS AND VANDALISM OF THE GERMANS

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When Baron von Richthofen, Leader of the "Flying Circus" and Accredited with More than 60 Victories, was Felled within British Lines, He was Buried with Full Military Honors. The Picture Presented Above Shows Australians Firing a Volley over His Grave

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Canadian Soldiers Looking into a Family Tomb near Lens That had been Violated by the Huns: The Coffins had been Removed and the Bones of the Dead Strewn about the Floor of the Vault

After Scoffing at British and French Tanks as Colossal Jokes, the Huns have Built Some for Themselves. One of These, Operating in the Vicinity of Montdidier, was Bowled over by a French Shell. A German Tank is Armed at the Bow with a Small Cannon and at Each Side with Two Machine Guns

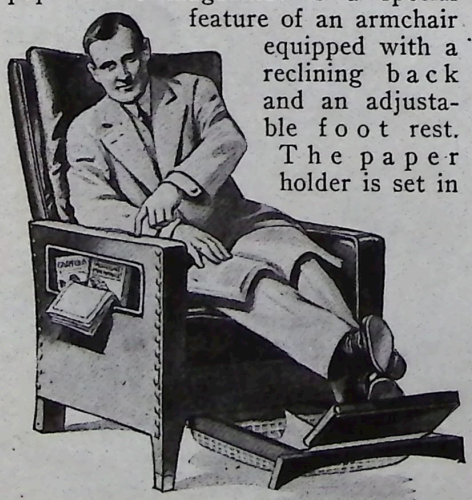
POLICEMEN CARRY PISTOLS OVER HEART

With the donning of new summer uniforms by the motorcycle patrolmen of New Orleans, their pistols have disappeared from the hip pocket though still a part of the equipment. Instead of being worn as heretofore the weapon is carried inside the shirt over the heart, in a shoulder holster. The uniform is of khaki but darker than that worn by soldiers.

A New Orleans Motorcycle Officer in the New Soldierly Uniform: The Pistol is Carried over the Heart in a Shoulder Holster

CHAIR HAS DISAPPEARING BASKET FOR MAGAZINES

A disappearing basket for newspapers and magazines is a special feature of an armchair equipped with a reclining back and an adjustable foot rest. The paper holder is set in the frame of the foot rest, just back of the cushioned portion, and when the rest is pushed under the seat, the basket is entirely hidden from view. In one arm is a pocket, also, and a push button for releasing the back.



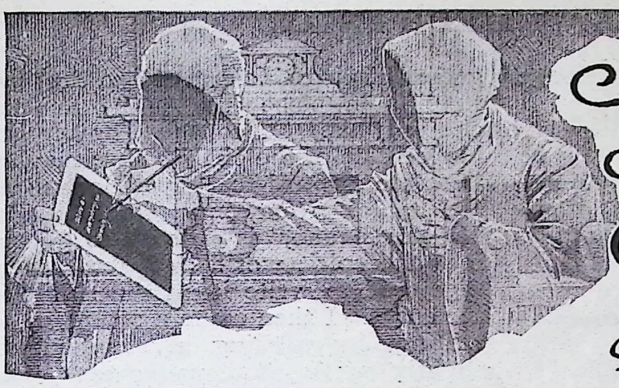
Reclining Chair with Newspaper and Magazine Holders Incorporated in the Disappearing Foot Rest and in One Arm

HOW OUR RED CROSS CARES FOR CAPTURED SAMMIES

Persons feeling deep concern for our men who are made prisoners by the Germans will find considerable comfort in what the International and the American Red Cross organizations have done and will continue to do for our men who are captured. The latter society has already accumulated enough food, clothing, and comforts at Berne, Switzerland, to maintain 10,000 American prisoners in Germany six months, and is adding to its stores.

Up to a few weeks ago there were only 186 American prisoners, but these were being supplied twice a week with packages of food and, where needed, with clothing of proper sizes. As a precaution against confiscation of the packages en route, the American Red Cross, which sends its materials into Germany through the international organization, incloses a return post card with each bundle. This is to be filled out in the prisoner's own handwriting and serves as an acknowledgment. In case signatures appear suspicious, careful comparison with records is made and, if need be, relatives who know the writing of the prisoner in question are consulted. It can be stated that the 186 men referred to have been heard from regularly by this means, and there is every reason to believe the signatures are genuine.

Letters and spending money are all that relatives of prisoners should attempt to send, the Red Cross officials say. The latter's packages are adequate and are much more apt to reach their destination. Packages of food are sent biweekly and contain 8½ to 10 lb. of nourishing provisions, selected according to the advice of dietary experts.



A Spirit Slate-Writing Experiment

by David P. Abbott

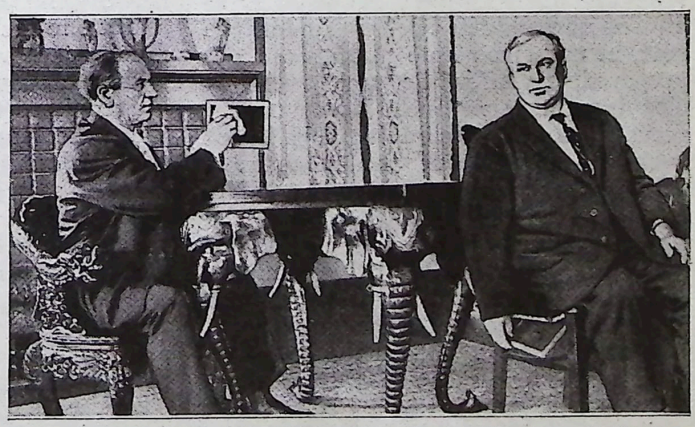
SOME years ago a spirit medium created quite a furore by giving spirit slate writings over this country. Many persons went for sittings and obtained messages, no matter what conditions were imposed on the medium. Some were believers and some investigators; yet all failed to find any physical means by which the writings were produced.

On entering the medium's parlor, the guest was seated at a small table, and two slates were laid upon it. The medium took a seat opposite the sitter. The latter was then instructed to clean both slates carefully, whereupon they were instantly placed underneath the table, and both guest and medium would hold them there. A sound, as of writing, would be heard, and then the guest, upon withdrawing the slates, would find a lengthy message written upon one of them.

The table was an ordinary affair, and any examination of it, or the medium, was permitted; yet nothing could be found to explain the mystery. The writing was genuine and written with a slate pencil, as could be verified. There was no other thing in the room, and the phenomenon remained a mystery. At a later date, a certain dealer in such things advertised the secret of this mystery for sale.

The writer has performed the same experiment for years with the greatest success and effect. If there are other guests in the room, they are seated opposite the performer and behind the sitter, so they can observe the performance from that position. If the message contains matters of a personal nature long forgotten, and is signed by some friend long since dead, the effect is, of course, very impressive and startling.

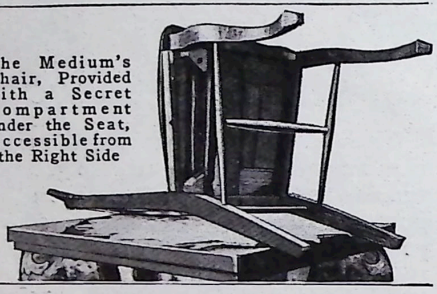
There are many methods of producing slate messages, but one of the best, which is here explained, is based upon the principle of secretly exchanging an examined slate for a similar slate upon which is a previously prepared message. Of course, the slates must be exact duplicates. If, through inquiries, the performer can obtain some information of a personal nature about the sitter and the names of some dead



While the Guest's Attention is Occupied Cleaning One Slate, the Medium is Exchanging His Slate for Another Concealed in the Secret Compartment beneath His Chair Seat. Here the Medium has Turned His Chair Around to Show the Compartment

friends or relatives of his, the message can be made very impressive.

The prepared slate must be concealed in advance where it can be quickly exchanged for the "dummy" at the right instant. The table is always an object of suspicion, and is



The Medium's Chair, Provided with a Secret Compartment under the Seat, Accessible from the Right Side

therefore usually examined by doubting persons, as is also the performer's person; but no one would think of examining the chair on which the performer sits.

In the photograph reproduced herewith, I have turned sidewise to the reader, in order that he may see me slipping the cleaned "dummy" onto one of the hidden shelves under the seat, at the same time pulling out the prepared slate, while my guest is cleaning the other one. However, my actual position, when doing this, is not such as shown, but the mechanical side of the chair is next to the table. In that way, the table hides from the guest's view what I am doing, and if there are other guests behind him, a cover on the table will prevent them from detecting me in the trick.

I first instruct the sitter to clean both slates carefully, and just as he finishes one, I take it in my right hand and apparently place it under the table. In reality I raise the side of the box-seat chair (which is hinged at the top) and slip the "dummy" in on the top shelf, quietly and quickly draw the prepared slate from the lower shelf, and place it under the table against the top, message side up. In order to distract the sitter, I instruct him to place his slate, as soon as he has cleaned it, under the table beneath mine, and help me hold the two together, timing this request so that my slate is in place just as he finishes cleaning his. Of course, I lower the hinged side of the chair before moving the slate upward to its position under the table. Next, my spirit guide, "Doctor Bruno," is ordered to go out into the spirit world and get a message, and to write it on the slate for the spirit. I then make a sound, as of writing, by rubbing my finger nail slightly on the slate under the table; and then I tell the sitter to examine his slates. He does so and finds the message on the upper one.

To prepare this trick chair, I got a cane-top, box-seat chair, removed the cane top, and replaced it with a solid-leather cobbler seat. This concealed anything underneath the seat. I then took a fine-toothed saw and neatly sawed the sidepiece, where it is set into the legs, on the right side of the chair only. Next, I loosened it from the seat, and ripped the piece in two, using care not to mar the finish. I did this to make it a half inch or less thick. The piece in the first place was about one inch thick and it took up too much space when raised. I left it full width, of course. After ripping it, I hinged it to the chair at the top, setting the three small brass hinges slightly out of line, so that the sidepiece is raised and lowered somewhat stiffly, stopping in open or closed position as desired. It is about two inches wide. When not in use, the sidepiece is left down; but when performing, after the sitter is seated, I allow my right arm to drop to my side and quietly raise the sidepiece ready for the trick. Then, while pretending to put the first cleaned slate under the table, I exchange slates, as previously described, and close the sidepiece. The move should be executed as nearly as possible without pause so that the performer appears to place his slate under the table in a natural manner.

The two thin shelves under the chair seat are padded with black cloth on the edges and tops so as to avoid noise in moving the slates in or out. The slates used are not of the bound va-

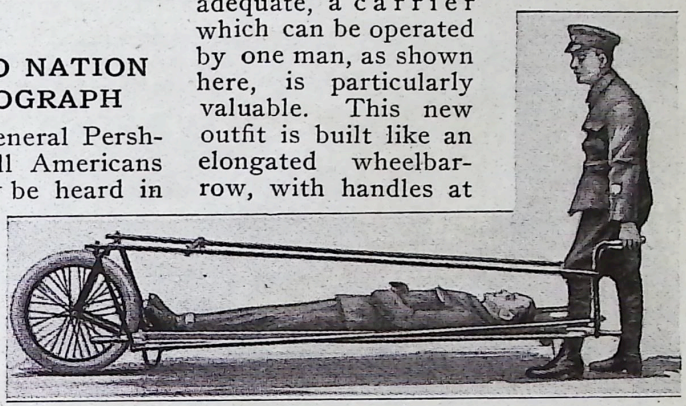
riety, as wooden frames slip more easily. It is well, also, to have the under side of the seat not covered with black cloth painted dead black. Thus no one ever gets a "flash" of anything under it.

GENERAL TALKS TO NATION THROUGH PHONOGRAPH

Within a short time General Pershing's voice, calling on all Americans to support the war, will be heard in every part of the country. This is not a figurative statement, for the head of our forces abroad has dictated a message for phonographic records, the matrix for which has already been sent back to this country. The record, which contains a patriotic appeal, was made at the front within sound of the guns. Special plans have been made for a wide distribution of disks bearing this message as soon as the matrix is received.

NEW ONE-WHEEL STRETCHER CARRIER SAVES LABOR

In the present war in which the force of stretcher bearers is often utterly inadequate, a carrier which can be operated by one man, as shown here, is particularly valuable. This new outfit is built like an elongated wheelbarrow, with handles at one end and a pneumatic-tired wheel at the other. On a road, indoors, or in fields where the going is fairly smooth, one man can carry a wounded soldier as easily as two with the usual equipment.

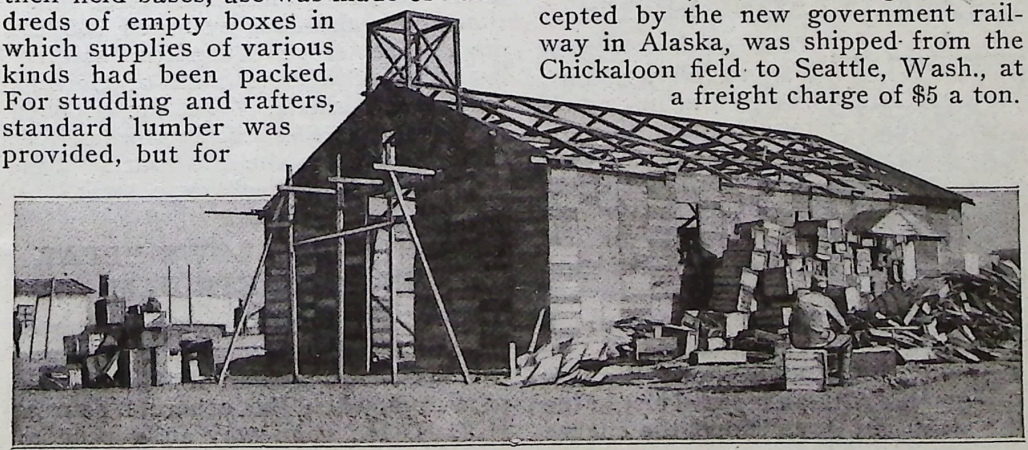


COURTESY, ILLUSTRATED LONDON NEWS

The Use of Stretcher Carriers of This Sort Greatly Increases the Work Accomplished by a Force of Attendants in a Given Time

CHURCH IS BUILT OF BOXES BY SERBIAN FIGHTERS

When Serbian soldiers wished some time ago to erect a chapel at one of their field bases, use was made of hundreds of empty boxes in which supplies of various kinds had been packed. For studding and rafters, standard lumber was provided, but for siding and flooring, and most other purposes, boxes and crates furnished the material.



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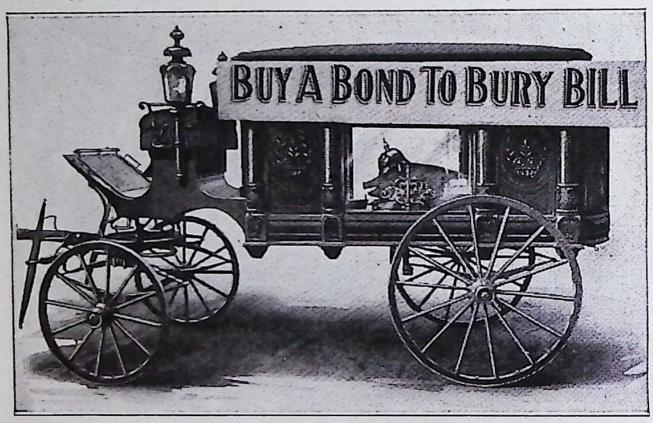
The Packing-Box Chapel in Course of Construction: Standard Lumber Not Being Available, the Soldiers Made Use of What Was at Hand

¶During the last week of April 100 tons of coal, the first consignment accepted by the new government railway in Alaska, was shipped from the Chickaloon field to Seattle, Wash., at a freight charge of $5 a ton.

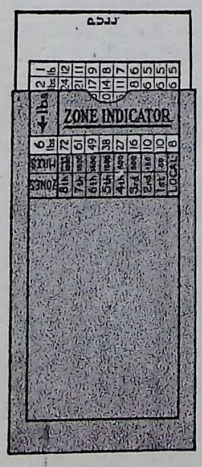
HOG'S CARCASS CARRIED IN HEARSE IN PARADE

Liberty-loan boosters in Alma, Mich., in their enthusiasm for the cause, prepared a float for a parade which reflected their attitude and sentiments in terms absolutely unmistakable. It consisted of a hearse, through the glass sides of which could be seen a hog's carcass. On the animal's head was placed a German helmet picked up on the Marne battle field. Hidden bulbs lighted up the interior and a sign on the side read, "Buy a Bond to Bury Bill."



A Special Feature in the Liberty Loan Parade at Alma, Michigan: The Helmet was Left by a German on the Marne Battle Field

PARCEL-POST RATES SHOWN BY CALCULATING DEVICE



A new advertising novelty, in the form of an envelope bearing the advertiser's card, contains a sliding insert showing the parcel-post rates for all zones and weights up to 20 lb. By adjusting the card so that the proper column shows through an indexed slot in the envelope, the charge for a given weight and zone is found.

ADVANTAGES OF MAGNETIC BAND DRIVE SHOWN

Having tested the matter extensively, an Australian engineer is of the opinion that the magnetic steel-band drive can be applied to good advantage in many places, notably for heavy drives where a fluctuating load has to be transmitted with a large reduction ratio. He has found that good adhesion can be obtained between magnetic pulleys and steel bands, .015 in., or more, in thickness. The magnetic drive effects a big saving in horsepower as compared with a belt or a rope drive.

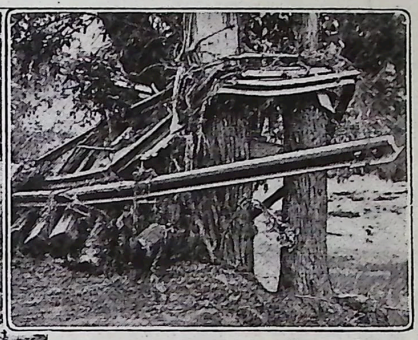
EIGHT THOUSAND ARE NAMED IN TOTAL CASUALTY LIST

General Pershing's records show a total of 8,170 names on the casualty list of the American expeditionary forces for the period ending June 18. Deaths from all causes numbered 3,220. The roll of wounded stood at 4,606. In addition, 344 men were reported missing. Eight hundred and ninety-seven men had been killed in action, and of the 4,606 wounded, 368 had died. Far more American soldiers had died of disease than of German bullets and shells. The list of dead included the 291 soldiers who lost their lives when the transports "Tuscania" and "Antilles" were sunk.

DISASTER FOLLOWS BREAK IN CONCRETE DAM

With only ten minutes' warning of impending disaster, all endangered persons, save a woman of 92, were able to escape when the concrete dam at Hill, N. H., gave way in a peculiar manner a few weeks ago. An electric-power plant, two manufacturing es-

After the Disaster: Looking Downstream through the Hole Which the Water Tore in the Concrete Dam Leaving the Upper Part Intact



Steel Rail Bent Like Straw about Tree Trunks by the Force of the Torrent

In the Path of Destruction: One of Several Houses Wrecked by the Flood. Two Factories and a Lighting Plant were Also Damaged

tablishments, and several houses and barns, as well as a railroad bridge and a quarter of a mile of track, were wrecked by the terrific torrent.

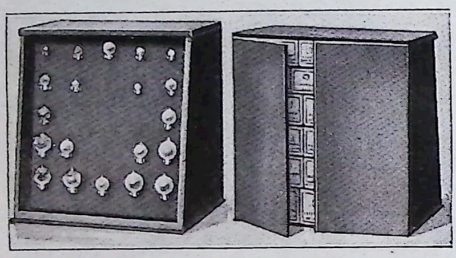
The dam was a comparatively new concrete structure, 100 ft. long and 45 ft. high, which held back the water in a stream for a distance of one mile. Apparently the foundation, or a portion of the wall, was defective, for the water tore a great hole in the base of the structure through which the water rushed, leaving the upper part intact. The warning was given by a watchman who, on discovering a small stream squirting from the lower side of the dam, rushed down the stream sounding the alarm.

CADET BALLOON OBSERVERS ESCAPE DEATH IN STORM

Three cadets in two observation balloons, at one of the training camps, had narrow escapes from death when caught in a severe storm. A sudden blast of wind drove one of the bags, nose down, in a 1,000-ft. dive to earth. Fortunately for its student observer, the balloon brushed against one side of a house so that the force of the plunge was broken, and the boy escaped without serious injuries. The other balloon, with two cadets in its basket, made a similar fast descent. Its basket struck the ground with sufficient impact to throw out one of the occupants. It rebounded, rose to a considerable height with the third cadet an unconscious prisoner, and was struck by lightning. Bursting into flames, it began to fall. Finally it swept along a few feet above the ground until the basket struck a fence post and anchored. The blazing gas bag was blown clear of the carriage, and the cadet, stunned but not badly injured, was rescued.

DISPLAY AND STOCK CASE FOR AUTOMOBILE LAMPS

For use in small accessory shops and garages, a combination stock and display cabinet that accommodates



Convenient Display and Stock Case for Small Dealer Who Sells Electric Lamps to Motorists

motor-car electric bulbs has been introduced. It is of durable steel construction and mahogany finish. Clips on the display board, which forms the front of the cabinet, hold 20 lamps of different sizes and types, while the compartment has space for an assortment of 310 others.

RETAIL DELIVERIES CUT BY USE OF HANDY BAGS

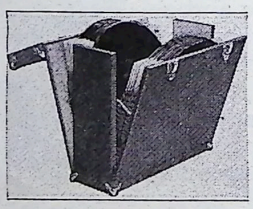
Large tough-paper sacks with two handles at the top, in which numerous bundles can be carried, are simple but very effective aids in the present movement to have fewer retail purchases delivered by the merchant. Often the mere suggestion from a clerk that purchases can be easily carried in one of these handy bags is sufficient to induce the customer to dispense with the delivery service. Buyers find that these bags are much more convenient to carry than market baskets.

CHOCOLATE BOX RESEMBLES BUNDLE OF SHINGLES

A candy manufacturer, seeking something out of the ordinary in the line of a container for chocolates, has packed his product in red-cedar boxes which look exactly like small bundles of shingles, including the band stick, and label. A simple manipulation of the former releases the cover so that the box can be opened. The candy maker has taken advantage of his opportunity to advertise the shingle business of his region by inclosing in each box a card giving statistics regarding the industry.

HANDY CASE FOR CARRYING PHONOGRAPH RECORDS

A carrying case of special design which opens in a convenient fashion, is being used by salesmen and others who carry phonographic records with them. It has a capacity of more than 20 disks, which are placed on edge and are separated by numbered paper partitions. The top, being hinged to one side, can be turned back out of the way, while the sides, which are hinged to the bottom, can be spread apart within the limits set by wire guards, making each record easily accessible.

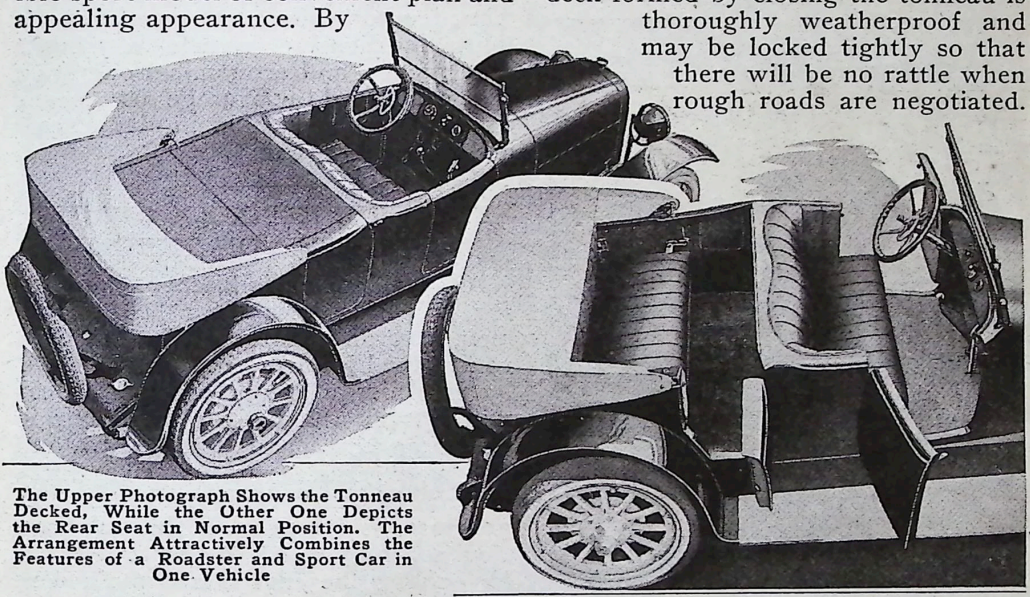


SWING BRIDGE COMPLETED ACROSS SUEZ CANAL

A swing bridge, it was recently announced, has been completed across the Suez Canal, thereby making possible direct railway connection between Cairo in Egypt, and Jerusalem and other points in Palestine. In view of recent successes of the British forces in the latter country, the new bridge undoubtedly is valuable from a military as well as a commercial standpoint.

NEW PLEASURE CAR HAS TWO-PURPOSE BODY

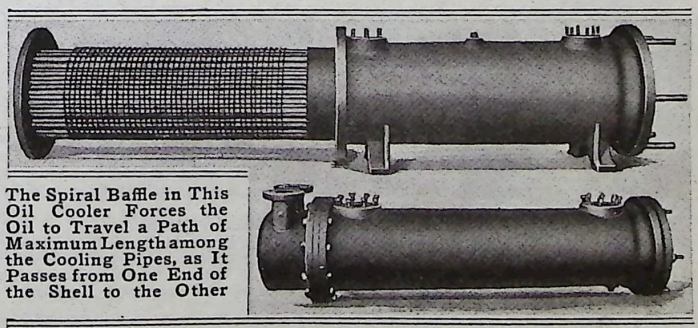
Among the attractive motor-car bodies of the season there is a convertible sport model of convenient plan and appealing appearance. By an ingenious arrangement that enables the base and back of the two upholstered sections of the rear seat to be raised so as to inclose the tonneau completely, the features of a two-passenger roadster and five-passenger touring car are provided in one vehicle. The steel deck formed by closing the tonneau is thoroughly weatherproof and may be locked tightly so that there will be no rattle when rough roads are negotiated. When the car is used as a roadster, the covered rear compartment offers excellent storage space for luggage, lunch kits, camp equipment, and spare tires.



The Upper Photograph Shows the Tonneau Decked, While the Other One Depicts the Rear Seat in Normal Position. The Arrangement Attractively Combines the Features of a Roadster and Sport Car in One Vehicle

FEATURE OF OIL COOLER IS HELICAL BAFFLE

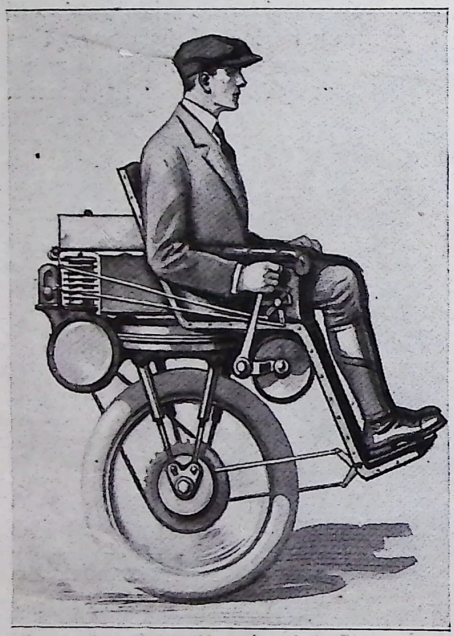
By installing, in a cylindrical shell, a long helical baffle surrounding the numerous cooling pipes which are filled with water, a cooler has been constructed which is said to possess remarkable efficiency in lowering the temperature of lubricating and quenching oils. The oil, entering the shell at one end, is forced to follow a spiral path to the opposite end, in the course of which it repeatedly strikes the cooling tubes almost at right angles. If need be, the bundle of tubes and the helical baffle can be removed as a unit for repairs or cleaning. This apparatus can also be used in recovering heat from waste liquors in dye houses, chemical plants, and the like, for utilization in preheating water used in the various processes.



The Spiral Baffle in This Oil Cooler Forces the Oil to Travel a Path of Maximum Length among the Cooling Pipes, as It Passes from One End of the Shell to the Other

SINGLE-WHEELED AUTOCYCLE HAS "ROCKING-CHAIR" SEAT

Without doubt the queerest motor vehicle that has of late been designed

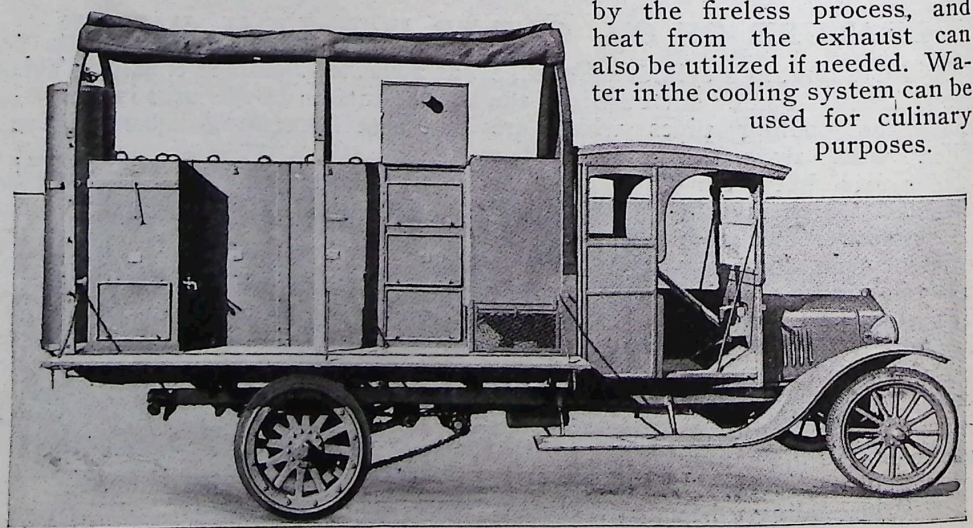


Gyroscopic Action Balances the Unicycle and Also is Used to Permit Steering

is a unicycle of altogether new character. This machine, unlike its predecessors, supports a chairlike seat above its single wheel instead of within it. Balance does not depend upon momentum, for it is taken care of by a gyroscope. Gyroscopic action is also utilized in steering the contrivance. The inventor's idea is the provision of a light, inexpensive vehicle of simple construction and economical operation that will afford the average man means of quick transportation in city streets and park driveways.

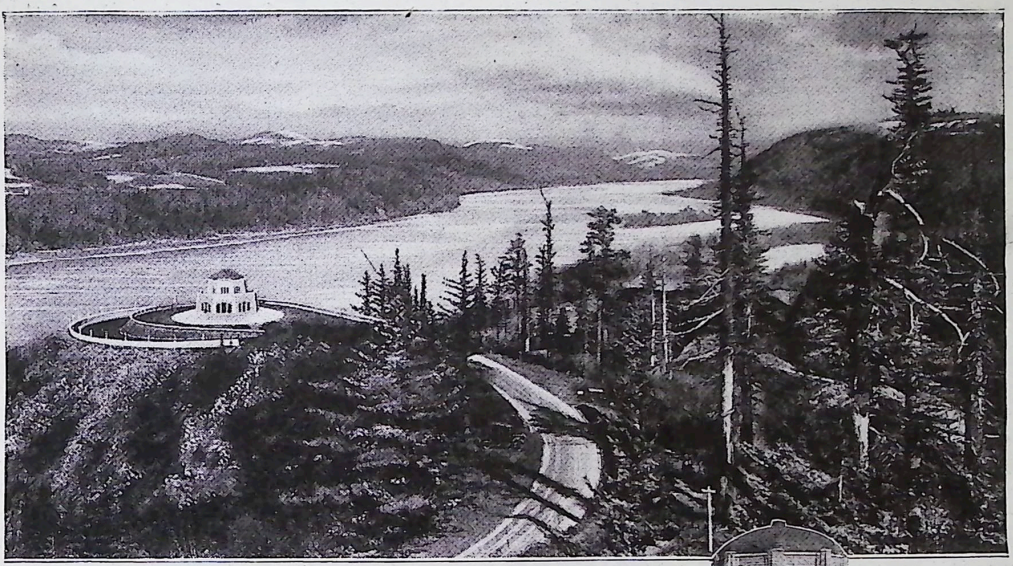
ELECTRIC KITCHEN OUTFIT MOUNTED ON TRUCK

A portable electric kitchen, equipped for preparing meals for 250 to 500 men, according to the menu, has been constructed for army use, and the like, by providing a low-priced touring car with a truck attachment and mounting on it a generator, rated at 6½ kw. and 125 volts, and various electrically heated cooking compartments. The generator is driven from the transmission shaft by a silent chain. Water for cooling the engine is contained in vertical tanks mounted at the rear, its circulation being produced by a centrifugal pump. Hinged platforms on either side of the truck give convenient access to the apparatus. All methods of cooking are provided for except broiling. Much of the cooking is done by the fireless process, and heat from the exhaust can also be utilized if needed. Water in the cooling system can be used for culinary purposes.

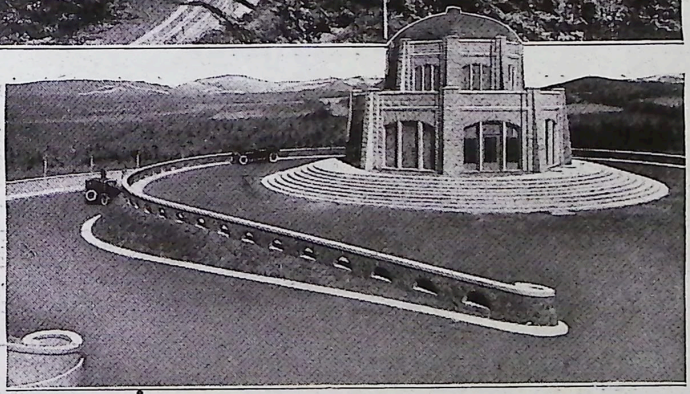


A Portable Electric Kitchen Built for Army Use, and the Like: The Generator Which Provides the Current is Driven from the Transmission Shaft. Meals for 250 to 500 Men can be Cooked at One Time

"VISTA HOUSE" NEW FEATURE ON COLUMBIA RIVER HIGHWAY



Panoramic View of the Columbia River Skirted by the Highway Bearing Its Name, with the New "Vista House," on Crown Point, in the Foreground



A Serviceable Memorial Occupying a Matchless Site: "Vista House," on the Columbia River Highway, Built in Honor of the Pioneers and for the Comfort and Convenience of the Public

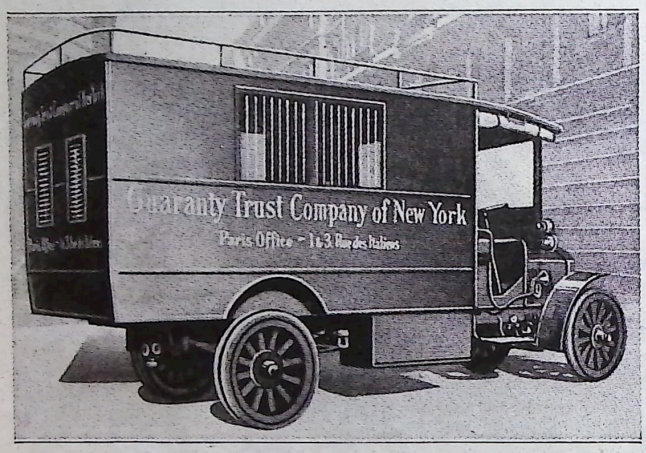
A striking memorial to the pioneers of Oregon, typical of the patriotism and local pride of the state, has just been dedicated at the famous Crown Point, on the Columbia River Highway. The structure, which cost $67,000 in addition to necessary road improvement near by, will serve as an observation point, rest house, and shelter for the thousands traveling the marvelous scenic road which encircles the knoll where it stands. It is of concrete construction, octagonal in design, and is 56 ft. high and 44 ft. in diameter above ground. The substructure which can be entered by a door in the hillside, is 64 ft. in diameter.

From the broad steps encircling the building and from the clerestory balcony may be obtained one of the most magnificent panoramic views in America. Provision is made in the "Vista House," as it is called, for memorial colored windows and eight panels, portraying the development of Oregon from pioneer days. Rest rooms, toilet facilities, first-aid quarters, refreshment stands, etc., are to be found in the building.

TRAVELING BRANCH BANK SERVES MEN AT FRONT

An eastern bank, which is a United States government depository, has acquired a special automobile truck for use at the European front as a traveling bank, operating from the Paris branch office. Since this in-

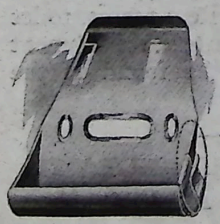
stitution acts as a paying and receiving agent for United States paymasters, and other disbursing officers in the army and navy, the vehicle is a great convenience for them. As it travels behind the lines it also cashes checks for, and sells drafts to, the soldiers. The body of the car is of oak, covered with thin plates of sheet iron. The windows, including two for tellers at the rear, are barred, while within is a small but strong safe securely fastened to the framework of the truck.



A Bank That Brings Money to Our Soldiers in the Trenches: An Armored Truck Equipped to Serve Our Paymasters and Soldiers at the Front

IMPROVED ERASER SHIELD HAS DUST RECEPTACLE

Because the dust that is produced in making erasures on typed matter often clogs the typewriter, an erasing shield has been made that catches these particles of grit and paper. The shield proper is curved to fit the typewriter cylinder and has the usual holes to place over the letters to be erased, while the lower side is extended into a troughlike receptacle into which the dust falls, instead of falling into the machine.

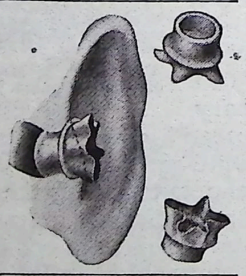


GOVERNMENT PATENTS BRASS FURNACE

Announcement has been made of the development by the Bureau of Mines of an electric furnace that reduces the important losses in brass melting through the volatilization of zinc in open crucibles. The new furnace is closed. Equally important at this time is the fact that the invention obviates the grave difficulty that has been experienced through inability to obtain imported clays used in making crucibles. Free licenses for the operation of furnaces of the new type under patents that have been issued, may be obtained, it is understood, by making application to the director of the Bureau of Mines.

PLIABLE-RUBBER EAR PLUGS FOR CIVIL AND WAR USES

Soft-rubber, vacuum ear plugs are serviceable accessories for bathers, as well as protection for those who, like army and navy men, are subjected to the heavy concussions of big guns and bursting shells. The devices are cup-shaped stoppers with fluted flanges, and when dampened and inserted in the ears are held in place by a slight suction force. They completely close the ear passage so that water is excluded for swimmers, and the force of heavy sound vibrations is materially reduced for boilermakers, structural steel workers, and fighting men.

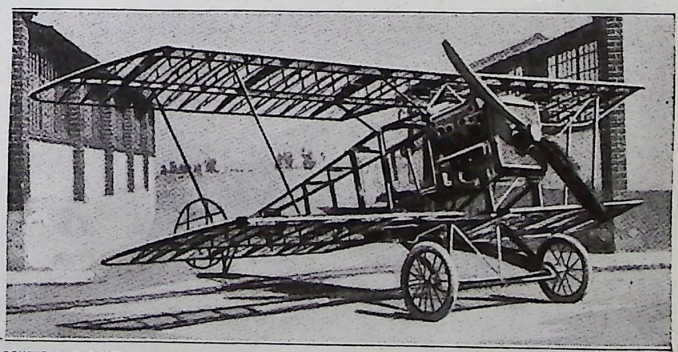


BARGES CARRY MOTOR CARS INTO SOUTH

THIS picture, taken at Cincinnati a short time ago, shows some of the 200 motor cars that were recently shipped on river barges from that city to Memphis. The machines were driven overland from Michigan to the point of embarkation. This means of transportation not only left many railway cars free for handling war materials, but also expedited delivery. Railroad conditions are reviving traffic on our waterways, and it is not at all improbable that greater use will be made of them in the near future than has been the practice for many years.

FAST SCOUT PLANE PRODUCT OF MEXICAN AERO PLANT

One of the latest products of Mexico's nationally owned aeroplane factory at Valbuena is a scout machine that in certain respects shows the influence of prevailing French tendencies in designing. The craft, known as the "Microplano," is supposed to develop a speed of from 119 to 132 miles an hour in horizontal flight. It is a biplane with a wing span of 26 ft. 8 in. and an over-all length of 22 ft. 8 in. The motor is the 150-hp. model of a well-known Spanish type that is being manufactured at the Valbuena plant. In wing design the machine has characteristics in common with the Morane. The body is of rectangular cross section. No stationary surfaces are provided at the tail. The propeller is one of domestic invention.



COURTESY OF TOHTLI

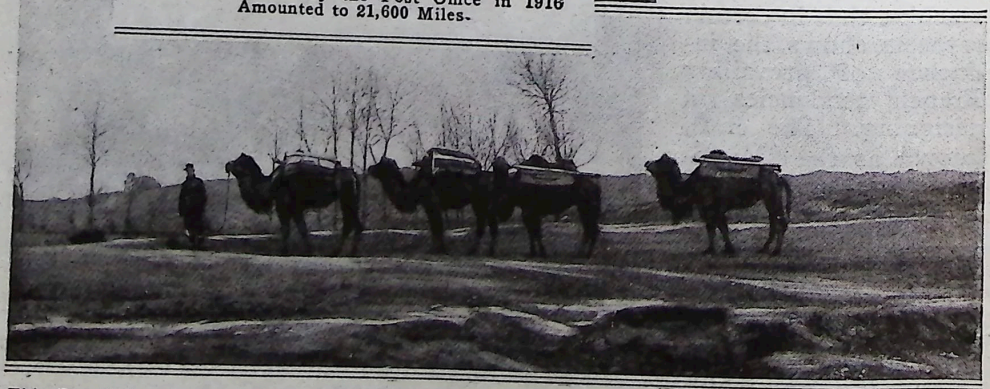
Showing the Frame Construction of the "Microplano," the Latest Product of Mexico's Government-Owned Aeroplane Factory at Valbuena

Maintaining Mail Service

Mounted Courier Fording Icy Stream in Sinkiang

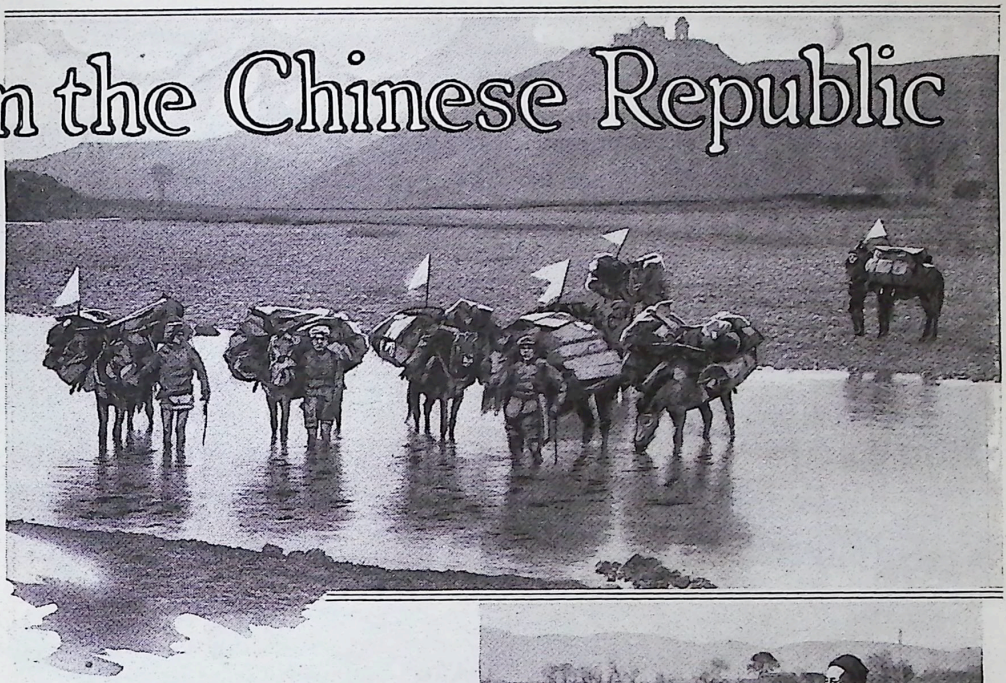
Chinese Post Boat Navigating a Rapids: Boat Lines Maintained by the Post Office in 1916 Amounted to 21,600 Miles.

IN a little more than 20 years China has built up a national postal system which is one of the best and cheapest in the world. This has been done in spite of extraordinary difficulties, due not only to the vastness of the population and territory served, but also to the fact that in recent



This Camel Caravan with Inland Mail was Photographed in Sinkiang. Such Means of Transportation is Chiefly Used in Certain Parts of Mongolia. With the Equipment Shown, Each of These "Ships of the Desert" Is Able to Carry a Surprising Amount of Mail

in the Chinese Republic



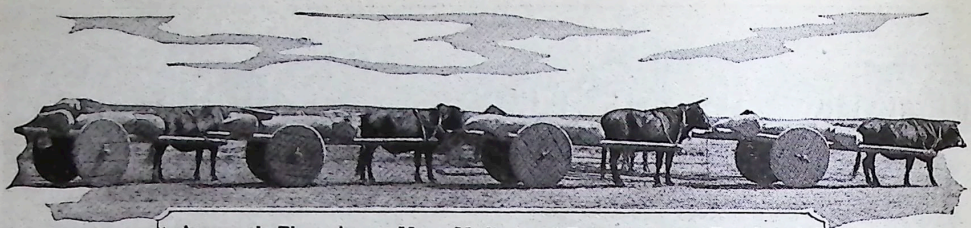
Second-Class, Slow-Going Mail is Usually Handled by Pack Mules or Native Carts

years the monarchy has given place to a republic, and several provinces have declared their independence. Regardless of revolutions the service has been maintained.

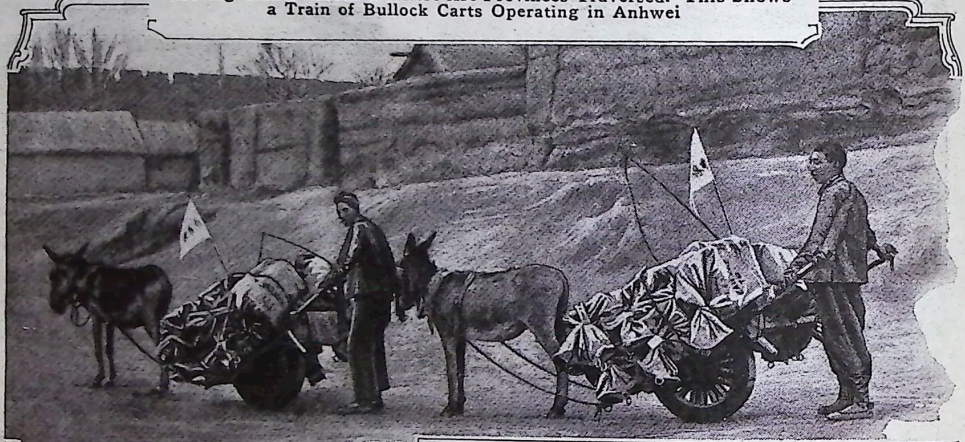
Since there are only about 6,300 miles of railway for carrying mail in China, a big part of the transportation is done on boat lines aggregating 21,600 miles, and by courier lines which total

An Overland Wheelbarrow "Mail Train" under Way in Kiangsi: A Slow, but in Fair Weather Steady, Means of Inland Transportation

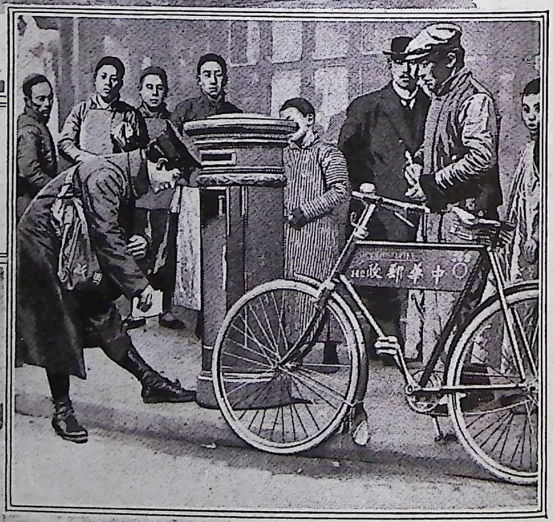
Here Is One of the Shallow-Draft Post Boats Used for Carrying Mails in the Eastern Province of Anhwei. It is Drawn by Water Buffaloes and Maintains Regular Service between Established Terminals



Apparently There Are as Many Mediums of Transportation Employed Moving Chinese Mails as There Are Provinces Traversed. This Shows a Train of Bullock Carts Operating in Anhwei



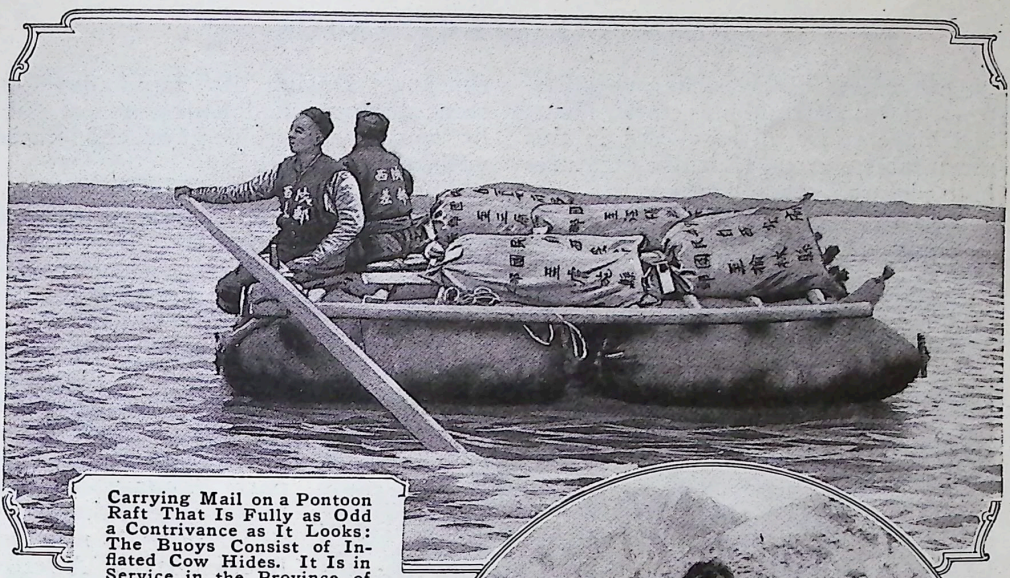
In the Province of Honan It Is Customary to See Mail Trains, of the Sort Pictured Above, Slowly Making Their Way across the Countryside. Wheelbarrows Drawn by Donkeys Carry Heavier Loads Than Those in Kiangsi, Which are Pushed by Men



The Postman Pictured Herewith Is of a Type That may be Found in Almost Any of the Large Cities of the Republic. Post Boxes of the Character Illustrated are Widely Used, and Bicycles Are Quite Common

Near Newchwang, in Manchuria, during the Long, Frozen Months of Winter, Mail is Carried in Covered Baskets Loaded on Low Sleds, of Which the One Illustrated Above Is Typical

PHOTOS BY COURTESY



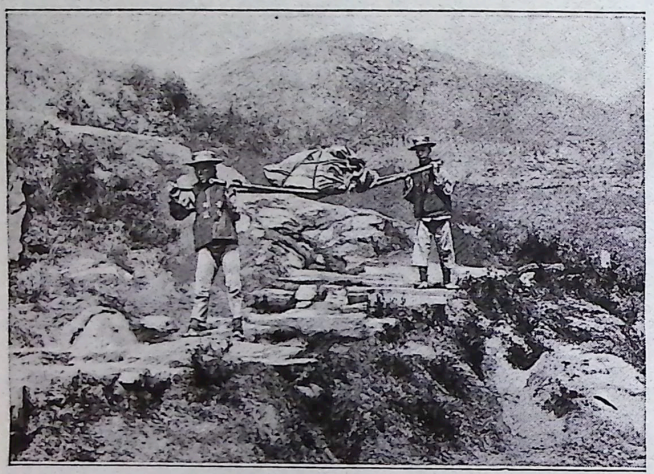
Carrying Mail on a Pontoon Raft That Is Fully as Odd a Contrivance as It Looks: The Buoys Consist of Inflated Cow Hides. It Is in Service in the Province of Shensi

Mongolian Mounted Courier on His Way to Urga with Mail: The Post Road Extends Northwesterly from Peking to Verkhni Udinsk, Siberia, Where It Joins the Trans-Siberian Railway

A Russian Mail Wagon in the Western Province of Sinkiang: During Times of Rebellion and Other Disturbances, the Transportation of Mail Continues, but Not without Couriers, Caravan Pilots, and Wagon Drivers being Subjected to the Danger of Marauding Bands

143,000 miles. Snow sleds, wheelbarrows, carts, pack animals, rafts, boats, and bicycles are all employed in this remarkable system, which has features both picturesque and hazardous.

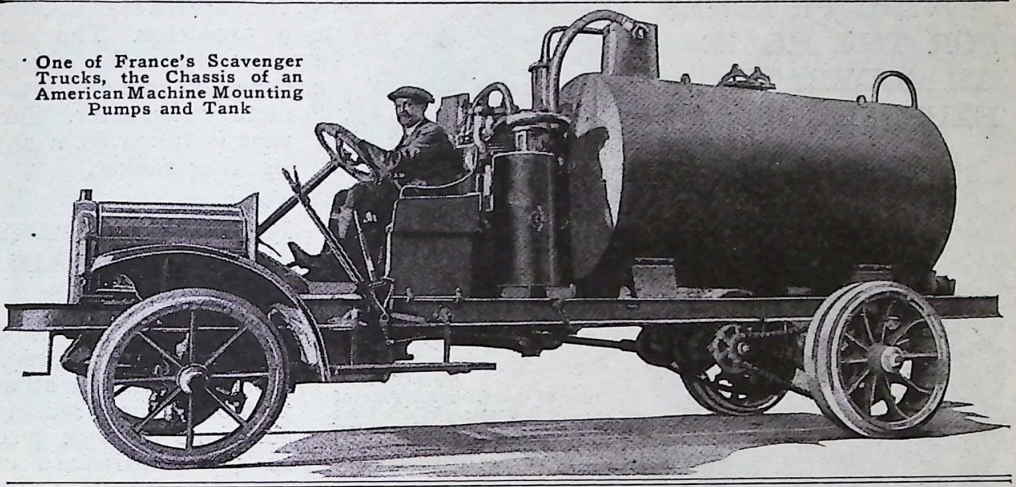
The Chinese post office, which received governmental sanction so recently as in 1896, had its beginnings in previous years in the postal departments of the customhouses at Shanghai, and elsewhere, established by Europeans. During its rapid development distinguished Europeans of public spirit have guided, or coöperated with, the Chinese.



Carrying Mail on Bamboo Poles along an Easy Stretch of a Difficult Mountain Trail: Many of the Post Roads Are Wretched, and Most of the Passes Still Worse

The system has grown in spite of twofold competition. The antiquated imperial - government courier service finally has been displaced. Numerous private postal agencies are being superseded more slowly, superior service and lower rates being the means of winning support. Today, in the large cities, there are as many as 12 mail deliveries daily. A letter for local delivery requires a stamp worth one-half cent, American money, and for domestic delivery, a stamp worth a cent and one-half, American money. In 1905, 76,000,000 pieces of mail were handled, while in 1916 the number was 850,000,000. In recent years the department has shown a profit and has made a steady growth in public favor.

Bags of Mail Cross This Stream in the Province of Szechuan by Trolley. The Scheme is Used Because No Bridge Is at Hand and the Crossing Is a Difficult One, Particularly during the Season of High Water



One of France's Scavenger Trucks, the Chassis of an American Machine Mounting Pumps and Tank

TRENCH SCAVENGERS BETTER CONDITIONS AT FRONT

Scavenger trucks are being used by the sanitation service in the French army to improve conditions at the front. Such a machine mounts powerful pumps and a large cylindrical tank. In operation it withdraws slimy water and filth from trenches, pools, and shell craters, thereby removing one of the most flagrant causes of disease.

ALIEN-PROPERTY OFFICIAL ASKS HELP OF PUBLIC

The government has publicly appealed to all patriotic persons who know of patents, royalties, or other properties owned by, or earning money for, an enemy, which have not been reported to the alien-property custodian at Washington, to help the authorities in locating such holdings. It is estimated that there are over 1,000 enemy-owned or controlled patents used in this country, and that 800 of these have not been reported. This means that 800 inventors or manufacturers are liable to $10,000 fine, or 10 years' imprisonment, or both. If the person using these properties will not report, it becomes the duty of loyal and patriotic citizens to do so, or to send in information so that the government can make an investigation.

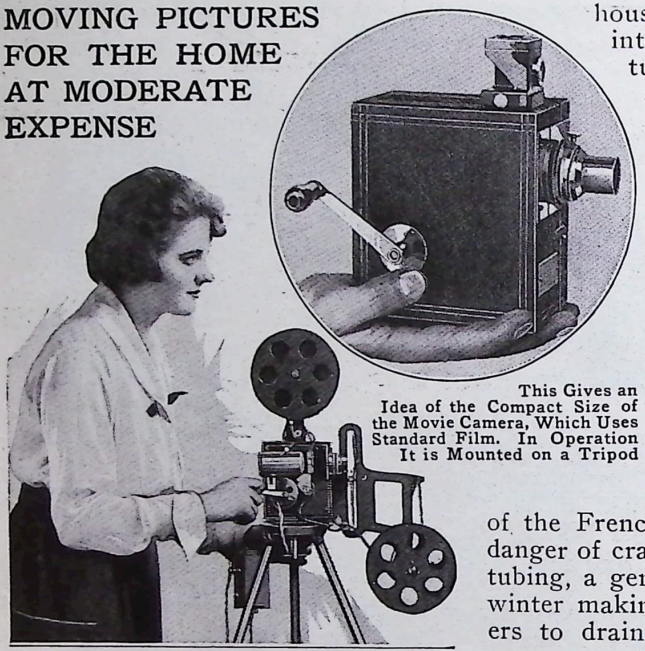
PAINT MAP OF TOWN RED TO HELP RED CROSS

"Paint the Town Red for the Red Cross" was the slogan adopted in a recent drive for funds for "the greatest mother in the world," by a town in the Southwest. A huge map of the community was prominently posted in the business district, and as soon as reports showed that every family in a block had contributed to the cause, that block was painted red. If only one family failed

"Painting the Town Red" in a New Way, for a Great Cause: All Blocks in Which Every Family Contributed to the Red Cross were Painted Red on the Map

to support the cause the entire block remained white. Needless to say, neighborhood sentiment stimulated the generosity of many who were tardy in making pledges.

MOVING PICTURES FOR THE HOME AT MODERATE EXPENSE



This Gives an Idea of the Compact Size of the Movie Camera, Which Uses Standard Film. In Operation It is Mounted on a Tripod

To Convert the Instrument to a Projector Requires Only a Moment's Time. Pictures on the Screen Are Clear and of Good Size for Home Purposes

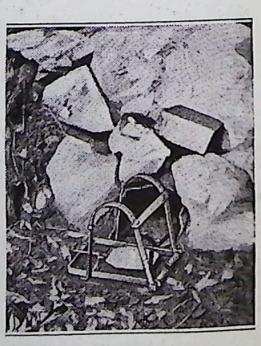
Those who long to perpetuate the first steps of a toddling youngster, or make permanent records of other intimate phases of home life, are now given the opportunity to do so. A comparatively inexpensive combination moving-picture camera and projector for amateur use has been introduced. It bears about the same relation to the costly and heavy professional machines as a compact, light camera does to a cumbersome apparatus employed by portrait photographers. Exclusive of its tripod, the new movie camera weighs less than three and a half pounds. It uses standard film and is operated as easily as any simple "still" instrument. The capacity of its magazines, designed for daylight loading, is 20 ft., which, because eight instead of 16 pictures are taken per second, records as much action as 40 ft. of film in a professional machine. Sharp, clear pictures capable of reasonable enlargement for "stills" are obtained. By changing the lens, attaching a light frame with reels of 200-ft. capacity, and mounting a small, cylindrical lamphouse, the camera is converted into a projector. The pictures cast on the screen are of good size and satisfactory character. Current is taken from any lighting socket.

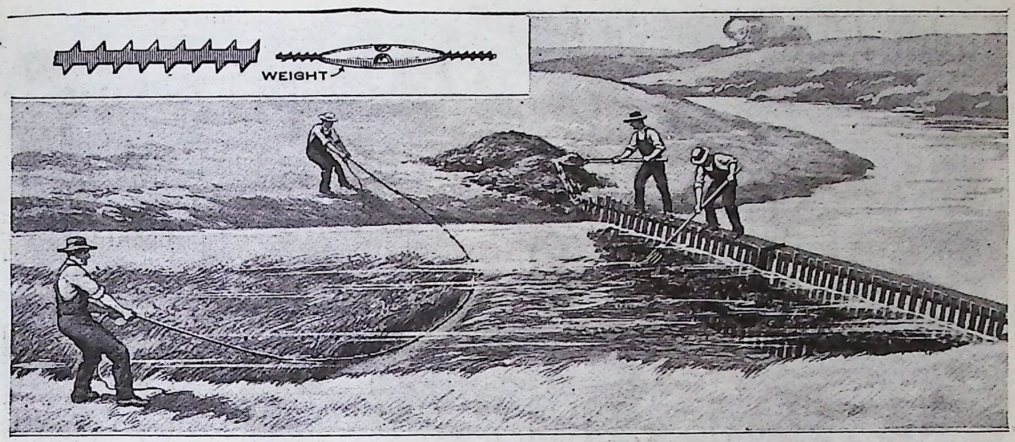
FRENCH MILITARY DRIVERS DRAIN RADIATORS

Because alcohol and glycerin are needed more seriously for other purposes, antifreezing solutions are not used in the radiators of trucks and cars of the French army. To obviate the danger of cracked cylinder jackets and tubing, a general order is issued each winter making it mandatory for drivers to drain the radiators whenever cars are to stand idle for several hours. While this rule is in effect, failure to execute it means a prison sentence. A second offense puts the violator in the first-line trenches. So, while the order is in force, it is usually observed, even though the temperature may be balmy.

TRAP DOES NOT HARM FUR OF ANIMALS CAUGHT

A newly patented trap is built so as to prevent injury to the fur of an animal caught in it. When a creature presses on a large plate in the bottom of the trap a rectangular jaw is released which crowds the body upward against the curved portion of two U-shaped bars. On the inner surface of the bars are prongs to prevent the withdrawal of the animal. The plate beneath the forefeet keeps the captive from carrying the trap far.





The Underwater Saw, Weighted at Three-Foot Intervals, Is a Fiftieth of an Inch Thick and Supplied with Teeth Having a Base and Height of One-Sixteenth Inch

WEEDS IN STREAMS ARE CUT BY SUBMARINE SAW

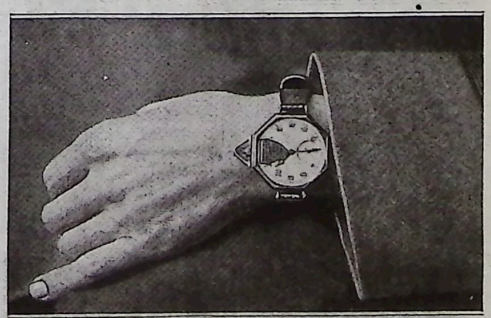
For clearing weeds from irrigation canals in California, the Reclamation Service has found an underwater saw most efficient and economical. It consists of a flexible tempered-steel tape with serrated edges, to which small iron weights are attached at 3-ft. intervals. The saw, with ropes tied at each of its ends, is drawn back and forth by two men stationed on opposite banks of a canal. The cutters proceed upstream. As they do so the mowed weeds are carried by the current to an inclined grating placed against a plank spanning the stream. As they collect there, the weeds are removed with pitchforks. The per-mile cost of this work varies from $20 to $50, according to conditions.

SAFETY-FIRST DISCIPLINE REDUCES CASUALTIES

The quite remarkable fact that only one major casualty occurred during the 18 months in which 800 men were employed in building a big Wisconsin power plant is attributed to the strict observance of safety-first regulations. The work included the construction of a dam and wings, 3,000 ft. long, containing 150,000 cu. yd. of concrete and 2,500 tons of steel. That individual workers are sometimes less careful regarding their personal safety than their employers, is shown by the fact that three of the men on the force, when off duty, took chances on a near-by lake in a frail skiff and were drowned.

PAINT FRATERNITY BADGES ON SOLDIERS' WATCHES

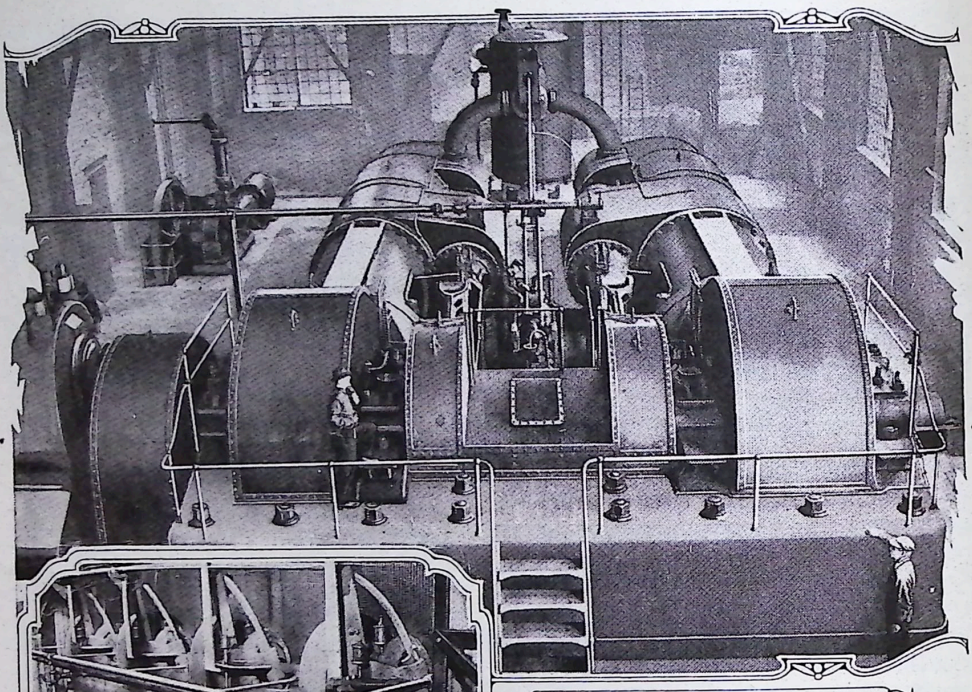
A custom being followed by soldiers belonging to fraternal or class organizations is to have the badge or emblem of such groups painted or enameled in colors on the dial of their wrist watches. This is preferable to wearing a pin on the uniform and yet it serves



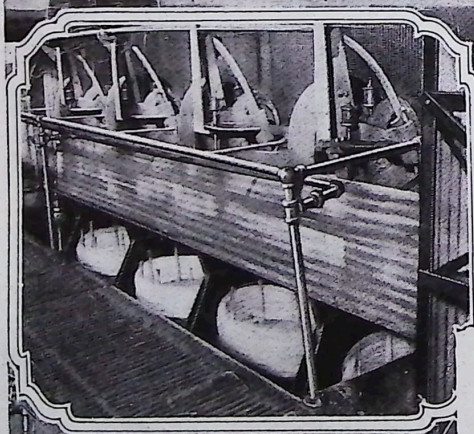
The Emblem of His Fraternal, or Other, Organization, Enameled on the Dial of a Soldier's Wrist Watch, Furnishes an Additional and Easily Recognized Means of Identification

as a means of identification, easily discovered by other members of the same society or group.

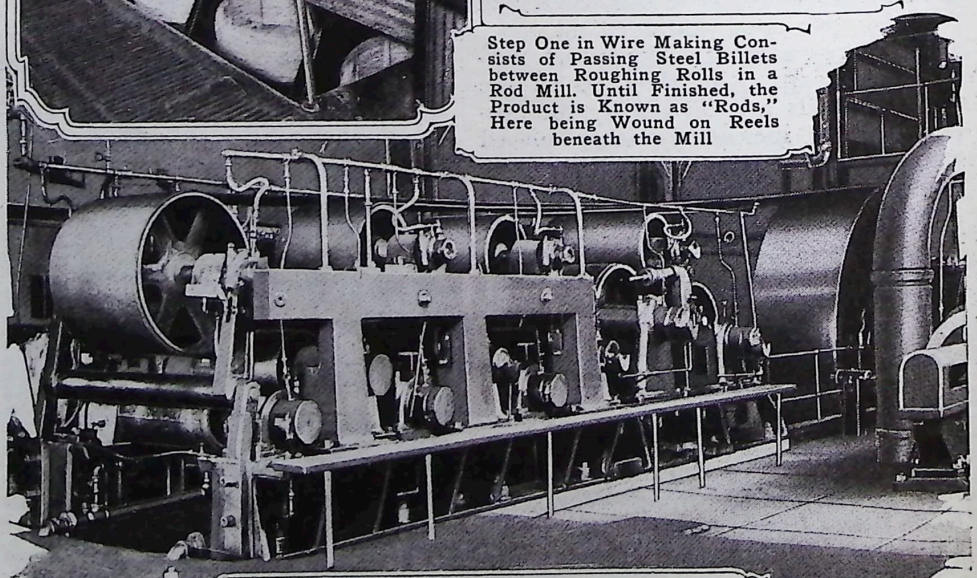
SOME INTERESTING RANDOM CAMERA GLIMPSES



Here Is a Close-Up View of a 25,000-Horsepower Blooming-Mill Engine. A Blooming Mill Is a Ponderous Contrivance in Which Steel Ingots, after being Reheated, are Rolled into Blooms for Additional Rolling into Slabs, Billets, and Sheet Bars



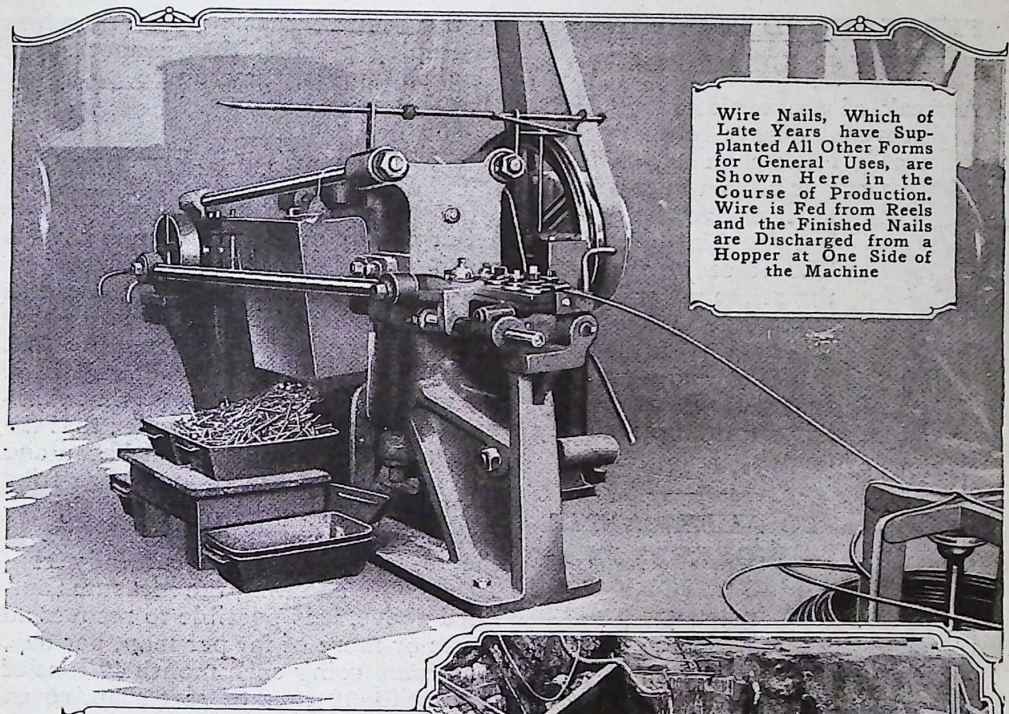
Step One in Wire Making Consists of Passing Steel Billets between Roughing Rolls in a Rod Mill. Until Finished, the Product is Known as "Rods," Here being Wound on Reels beneath the Mill



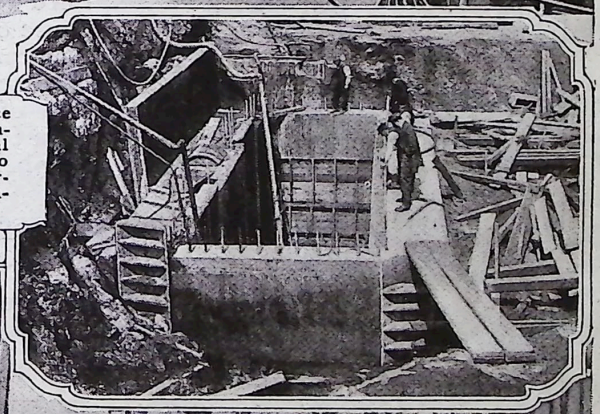
An Interesting System of Power Distribution is Shown Above. It will be Observed That the Open Flywheel in the Background Drives Four Belts, Which Turn the Big Pulleys Mounted along the Top of the Machine Pictured at the Left

COURTESY OF THE YOUNGSTOWN

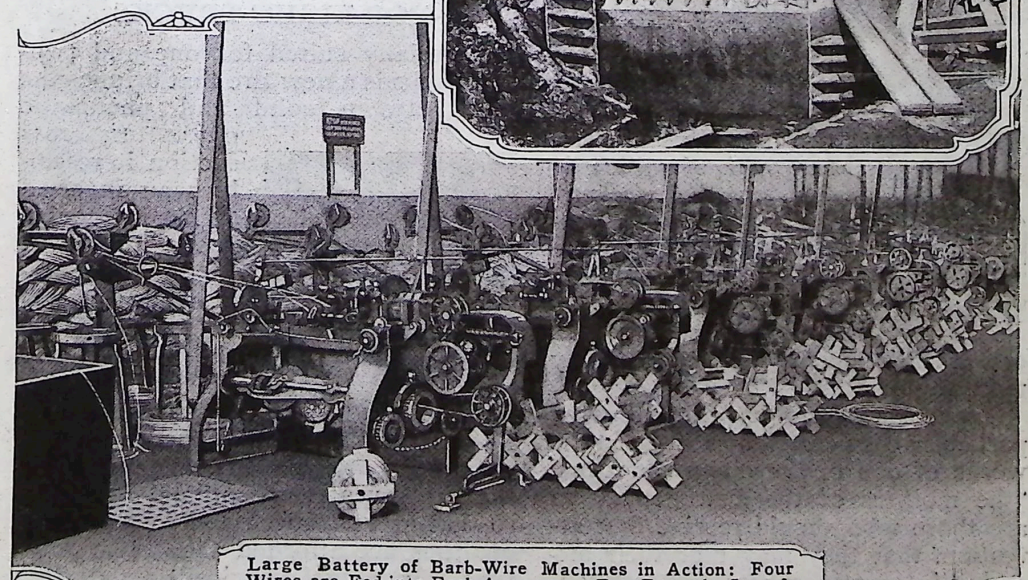
OF MACHINERY IN BIG MODERN STEEL PLANT



Wire Nails, Which of Late Years have Supplanted All Other Forms for General Uses, are Shown Here in the Course of Production. Wire is Fed from Reels and the Finished Nails are Discharged from a Hopper at One Side of the Machine



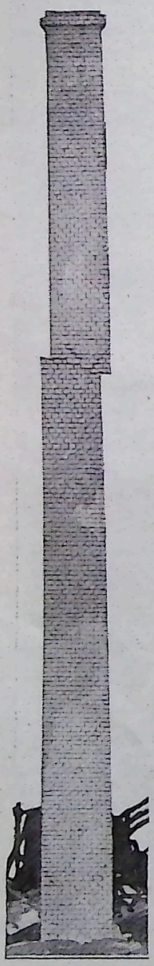
Building, 36 Feet below the Surface of the Ground, a Reinforced-Concrete Foundation for a Hot-Metal Mixer, the Purpose of Which is to Reduce Iron Brought from Different Furnaces to a Common Temperature and Quality



Large Battery of Barb-Wire Machines in Action: Four Wires are Fed into Each Apparatus. Two Form the Strands and Two the Barbs. Revolving Fingers Twist the Barb Wires about One of the Strands, and Shears Cut the Ends Diagonally. The Strands are Then Twisted and Reeled

FREAK FOUND IN CHIMNEY HIT BY HALIFAX BLAST

A freak of the explosion at Halifax, discovered during reconstruction work, was a brick chimney, 95 ft. in height, which was broken in two about 60 ft. above the ground but remained upright. The force of the blast thrust the upper portion to one side so that it was offset several inches. In fact it overhung to such an extent that passers-by felt that it might fall any minute.



TO AMERICANIZE WORKERS IN FACTORY SCHOOLS

Schools have been opened in a large number of manufacturing plants in Chicago, in charge of public-school teachers, to instruct foreign workers in English, and other subjects that will help Americanize them. The classes are conducted during the noon intermission, or after work, and generally last an hour, half of which is taken on the workers' time and half on the employer's time. Often the employes are so anxious to learn that they give up all their noon period, eating their lunch while they study their lessons.

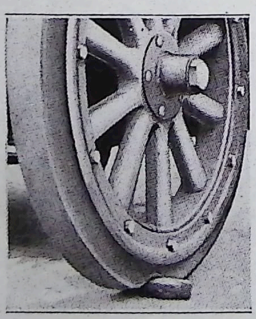
Women workers have been given particular consideration because, in the words of one of the city's educators, "the mothers of the next generation are those who should receive first attention, that they may rear their offspring in an atmosphere of Americanism." A practical step in assimilating our large foreign element is embodied in the request that employers refuse to employ persons that cannot speak English unless they agree to study that language.

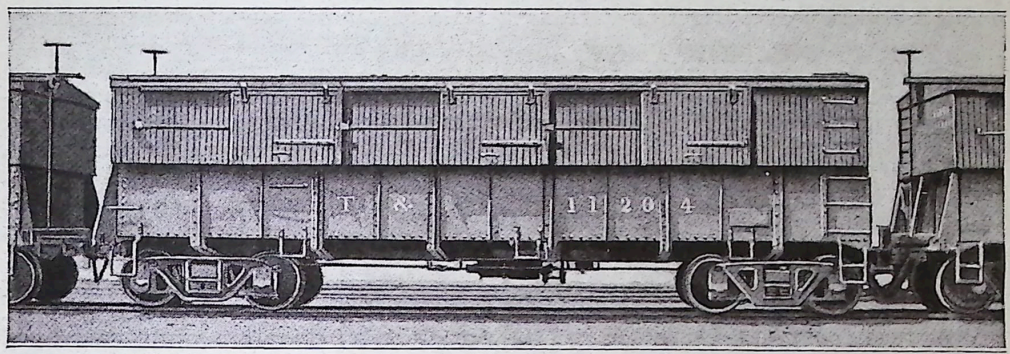
RECOVER FAT FROM CAMP FOOD AND DISHWATER

Surprising quantities of fat, now so much valued, have been collected in British camp and hospital kitchens as a result of special instructions that are now in force. The rules require that all bits of fat shall be collected from the men's plates after meals; that skimmings of stews shall be made; that the grease boiled from ham and bacon and left in pans in which foods are fried shall be saved, and that, by the installation of a simple trap, the fat in the dishwater shall be carefully conserved. By adopting the measures outlined above, it is possible to recover an ounce or more of fat per man, per day. One camp using each month 40 tons of hard soap, 10 tons of soft soap, seven tons of dubbing, etc., collected a sufficient amount of fat to produce these supplies.

SPECIAL SEMISOLID TIRE FOR LIGHT TRUCKS

Especially suited for one and two-ton trucks is a new tire that bridges the gap between solid and pneumatic ones. In cross section it resembles an inverted "Y." Its double bases are fitted in a clincher-flanged rim and held firmly in the viselike grip of an internal ring. An egg-shaped air space in the middle of the tire gives it exceptional resilience so that greater speed and easier riding qualities are afforded than with solid tires. In actual service tires of this type have gone from 25,000 to 45,000 miles.





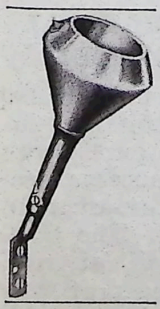
Steel and Wood Freight Cars, the Tops of Which Open Their Full Length and Breadth, Used in Carrying Copper Concentrates: The Uppers can be Removed, Making Each into a Gondola Car

ODD ORE CARS HALF WOOD AND HALF STEEL

Unusual-appearing cars, which are a combination of a steel gondola car and a wooden box car, are being used on the Santa Fe Railroad in handling copper concentrates. The lower half of each carrier, being of steel, is leak-proof to prevent loss of the fine ore. The car can be loaded either through three doors in the upper half of each side or through the top which can be opened for its full length and breadth. These features result in a great saving of the time required to fill and empty the cars.

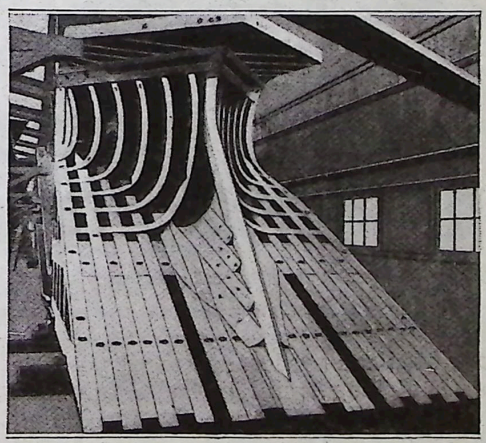
WASTE-PREVENTING CHALKER FOR BILLIARD CUES

For chalking the tips of billiard cues, a funnel-shaped device, designed to be attached to a table leg a few inches above the floor, has been introduced. One of its chief merits is that it prevents waste of chalk by using the powder form instead of the solid cubes. The tip of the cue is inserted in the mouth of the holder and a slight downward pressure exerted. This causes the contrivance to turn on its spiral support, thereby chalking and roughening the tip.



BIG WEDGE-TYPE SNOWPLOWS HAVE WOOD FRAMES

Contrary to what is perhaps the general impression, big railway snowplows of the wedge type are built with wood frames armored with steel, instead of being of all-metal construction. Unusually stanch fabrication throughout is imperative because of the heavy strains and severe shocks to which such plows are often subjected.



Standard Wedge Plow, in the Course of Construction, for Use in Bucking Snow Banks on a Canadian Railway

¶The Mexican cabinet is reported to have approved a law making American gold coins legal tender in the states of Sonora and Sinaloa, in western Mexico. This regulation will stand until the operation of an old mint in Sinaloa can be resumed.

ARMY TRACTORS HAUL VANS OVER BAD CANON TRAIL

Creeper-tread tractors are rendering a big service to our military forces on the Mexican border, making it possible to haul long trains of trailers, loaded with supplies, through the forbidding Pinto Cañon from Marfa, Texas, to the camps. Each train is composed of six or eight vans, weighing 6,000 or 7,000 lb. loaded. Despite rocky and sandy stretches, steep grades, and sharp curves, the big machines, which are nothing more than powerful farm tractors, make their way without difficulty. Each trailer is under perfect control and so connected that it follows around curves accurately. The tractors are of 75 hp., and each train has a crew of one engineer and several men, the latter taking care of the trailers.

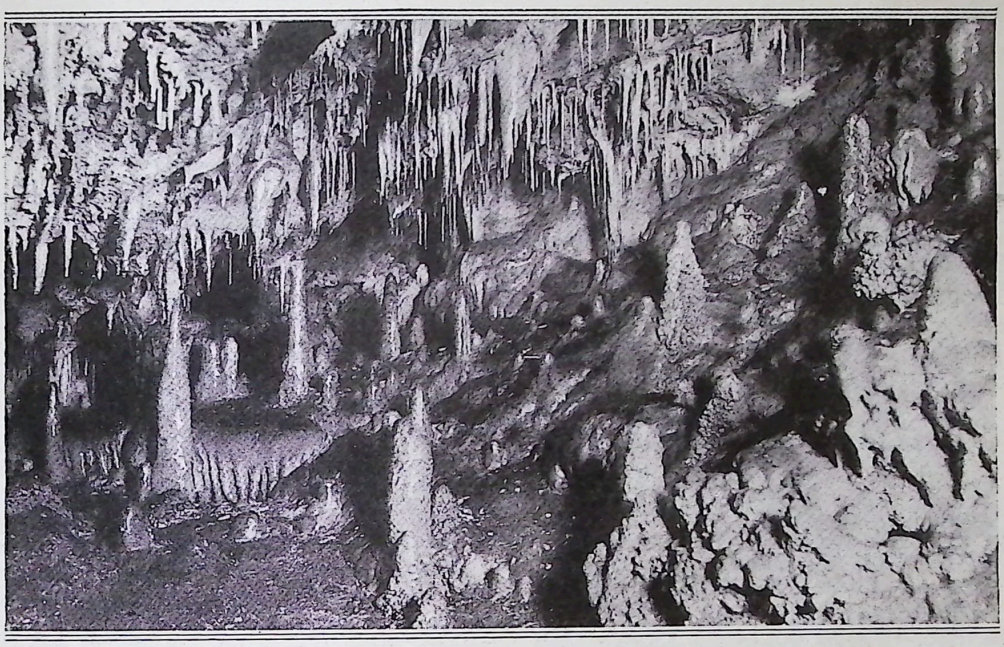
Three Tractors Hauling Trains Loaded with Army Supplies through Pinto Cañon, in Southwestern Texas, Which Engineers Thought Impassable for Heavy Motor Traffic: Note the Sharp Turns and Steep Slopes

DESTROY BARBERRY BUSHES IS PATRIOTIC APPEAL

The common barberry has been proclaimed the Hun among the shrubs that grace yards and parks. This condemnation, which does not include the Japanese variety, is based on the claim, now well substantiated, that the rust which in 1916, for example, destroyed 200,000,000 bu. of wheat in this country, must spend one stage of its existence on barberry leaves in the spring. Given proper weather conditions the spores sheltered here develop and are often carried 25 miles or more by the winds to wheat fields, where they multiply tremendously, blighting vast areas. North Dakota has prohibited the planting of barberry and ordered all bushes dug up. Minnesota has taken drastic steps with a similar aim. In the absence of laws in other states the Council of National Defense has called on all patriots to uproot and burn these noxious bushes wherever found on their premises.

CONCRETE BOILERS RADICAL PROPOSAL OF ENGINEER

Experiments are being made in the construction of concrete boilers. At the present time the idea is purely embryonic. In the event of success, the importance of such construction would be lowness of cost. The plan is to build the outer shell of two drums of thin steel. A space of two or three inches left between them would be filled with cement. Otherwise, the construction would be standard.



These Remarkable Caves Consist of Three and a Half Miles of Magnificent Marble Grottoes and Subterranean Passages. One Cavern Is a Veritable Convention Hall with a Vaulted Ceiling 100 Feet in Height

THE MARBLE CAVES OF OREGON

A New Goal for the American Tourist

By F. E. TUCK

AMID the wilds of southwestern Oregon, almost unknown to the world at large, is situated a series of underground chambers and passages remarkable for their size and for the beauty and unusual character of their decorations. Within the last few years they have been made a National Monument and are now known as the Marble Caves of Oregon.

They were discovered in 1874 by Elijah Davidson, an early pioneer, while trailing a wounded bear down the mountain side. Owing to their isolated location and high altitude they have remained almost unknown even to the people of the Pacific coast.

At the present time a visit to the caves is no small undertaking. From Grants Pass or Medford a 30-mile drive takes one to the camp at the end of the wagon road. The rest of the trip must be made on foot, or mule back, up a steep trail, 10 miles in length. During the summer months the Forestry Service stations a forester at the caves as guide and caretaker. He takes a special interest in conducting all visitors through the caves and in pointing out to them the many interesting features of the trip. Without him a view of the caves would be a dangerous and, in fact, an impossible undertaking. No charge is made for his services. Visitors should provide themselves with sufficient candles to burn for at least three hours, and should dress for strenuous climbing and crawling. Ladies can make the trip if not burdened with skirts.

The caves consist of three and a half miles of marble passages and grottoes, ranging from one to four or five stories in height. In places the connecting corridors are so low that one must crawl on all fours for a considerable distance. Elsewhere the chambers are so large that the opposite walls and ceiling are scarcely visible in the dim candle light. The largest cavern measures over 500 ft. in length, and its arched ceiling is 100 ft. above the floor.

Throughout the entire cave the stalactitic formations are rich and won-

derfully varied. In some chambers the ceiling is a mass of small stalactites, from the points of which hang starlike glittering pendants—drops of water. In one superb room the roof is covered with gigantic inverted white tulips; in another, folds of massive draperies cover the walls supported by immense fluted columns. Here stalactites reach down from above and embrace their stalagmitic sisters, thus forming pillars of surpassing symmetry and beauty; there a miniature Niagara stands outlined in white marble, beyond which a magnificent Solomon's Temple is carved deep into the heart of the mountain.

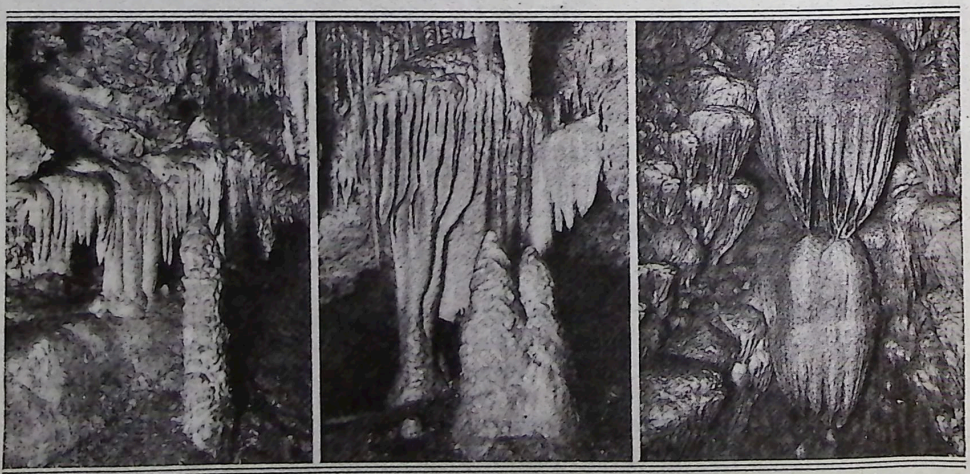
Through the lower levels of the cave flows a clear stream of water, the River Styx, over which visitors travel for some distance on a narrow plank footbridge. The pipes in the Organ Loft, when struck with a wooden mallet, sound weird tones which can be heard in the adjoining grotto, Old Nick's Bedchamber, with its four-poster bed of stalagmites.

In Windy Passage the candles are generally extinguished by the current of air which constantly sweeps through and, for once in their lives, visitors know what real darkness means. Fat Man's Grief, a long, low, narrow passage, is almost impassable for those who weigh over 200 lb., and great is the laughter which greets the heavyweight of the party as he slowly and painstakingly works his way through.

Besides these there are many other chambers and galleries, too numerous to mention, which have been given fantastic and appropriate names by visitors and guides.

The climb to the upper cave, 200 ft. above the lower chambers, is a very strenuous one. The first obstacle to be encountered is the Devil's Backbone. This is a long, sharp ridge with a yawning chasm on either side, and the only way to cross it in safety is to straddle it and hitch along a few inches at a time. The rest of the way is up ladders and chimneylike crevices in semidarkness, for the few candles carried by the party seem only to accentuate the gloom and to cast shadows where light is most needed. Exit can be made from the upper opening, thus avoiding what would be a very tiresome if not a dangerous descent back to the lower cave.

Time was, ages ago, when this was a vast ocean floor upon which deposits of lime were accumulating and over which played forms of life long since extinct. At a later date the great mountain rose from the surface of the ocean and the caves were formed in the manner common to the origin of most limestone caves. The dislocation



Each of the Pictures Above Shows Some Odd Formation Found in the Passages. Interesting Places Are: Solomon's Temple, Old Nick's Bedchamber, Devil's Backbone, and Fat Man's Grief

of the strata during periods of upheaval left crevices, or faults, whose marks are plainly visible in many cases, and through these faults water, impregnated with carbon dioxide, entered and dissolved the limestone, thus forming these remarkable underground chambers.

The trail up to the caves is a long, steep climb, but as one ascends, a marvelous panorama of scenic beauty, of forests and cañons, of snow-capped peaks and distant vistas, is spread out before him which, even apart from the caves, makes the trip one long to be remembered and well worth the effort it has taken.

IMPROVED CENTER-DROP TYPEWRITER DESK

In designing a new center-drop attachment for typewriter desks a common defect—lack of knee room when the desk is closed—has been entirely overcome. The hinged cover cut in the desk top measures only 14 in. from front to back, so that most of the top can be used for other purposes. The cover folds back like an organ cover, and if desired will serve as a copy holder. After opening the desk a metal curtain in front of the machine is swung on pivoted arms to the rear of the machine, bringing the latter into position.

The Center Drop Attachment in This Typewriter Desk Keeps the Machine in a Horizontal Position at All Times and Provides Ample Knee Room When the Desk is Closed

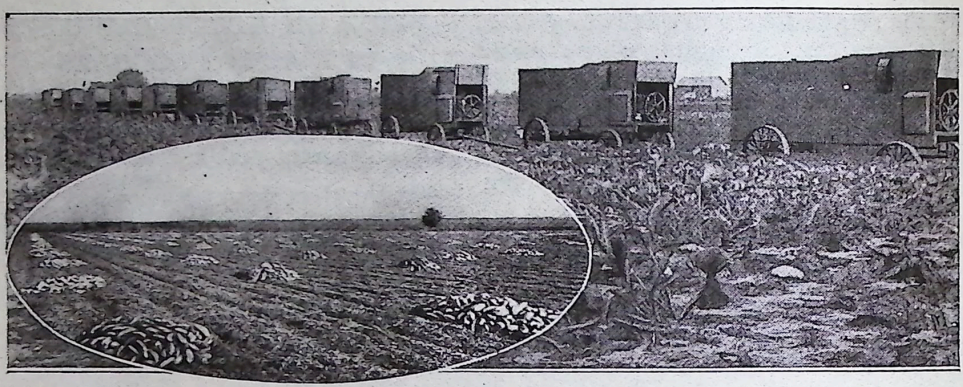
VISOR ON MOTOR CAP USED IN PLACE OF GOGGLES

One of the newest articles of apparel for the motorist is a cap with a visor of transparent amber celluloid, which can be drawn down over the eyes, taking the place of goggles. When such protection is not necessary a cloth cover is drawn over the visor, making the article appear like an ordinary cap. The cloth used is a khaki-colored, mercerized, whipcord material.

A New Motoring Cap with a Transparent Celluloid Visor That Takes the Place of Goggles: For Ordinary Wear the Cloth Covering is Drawn over the Visor as Shown

GERMAN RECORDS "INTERNED" BY PHONOGRAPH DEALERS

All phonograph records which might be considered German, either because of the language used or because of the composer's or author's nationality, have been banished from the music stores of an eastern city. One dealer picked out more than $3,000 worth of such records from his stock and displayed them on the sidewalk with this sign: "German Records Interned. Pro-Germans Help Yourselves." No one appeared ready to compromise his patriotism by accepting the invitation.



A Row of Threshers in a Cucumber Field: These Outfits Crush the Fruit and Then Separate the Coarse Pieces of Rind from the Seeds and Pulp. In Oval: A Big Colorado Field of Cucumbers; the Fruit is Gathered in Piles Preparatory to being Threshed

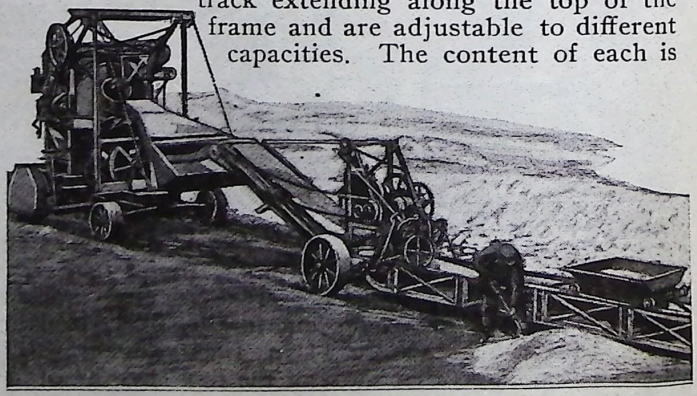
FIELDS OF CUCUMBERS THRESHED FOR SEED

Cucumber threshing, as carried on in Colorado and a few other states, is a task incidental to the raising of large quantities of cucumbers for seed, which requires special equipment and experience. From 400 to 600 lb. and occasionally 1,000 lb. of seed, can be obtained per acre. The mature fruit to be threshed is gathered in piles and the threshing outfit, usually mounted on running gear and driven by a gasoline engine, is drawn from one part of the field to another as the work progresses.

The cucumbers are shoveled into a crusher from which a mass of pulp and rind is discharged into a revolving wire-mesh reel, or drum, that separates the coarse pieces of rind from the pulp and seeds. The pulp and seeds are then stored in a pit for three or four days during which time fermentation loosens the seeds from the fiber. When water is run over the mass the pulp floats off, leaving the seeds. The latter are dried in large trays and put through a mill, which separates the foreign matter and light seeds from the ones suitable for planting.

SIXTY-FOOT LOADER SUITED FOR ANY TYPE OF MIXER

Prevailing labor conditions make the introduction of another mixer loader, designed for paving and construction work, of timely interest to many contractors. The apparatus is a combination of measuring bins and a belt conveyor applied to a portable machine that is operated and moved by its own power. Because of its length the contrivance is able to reach all of the materials piled within 60 ft. of a mixer. The measuring bins are carried on a track extending along the top of the frame and are adjustable to different capacities. The content of each is discharged onto the conveyor belt, which moves at a speed of 500 ft. a minute, by actuating a lever. Of particular importance is the fact that the equipment may be used with either side or end-loading mixers.



This Feeder, Suited for Either Side or End-Loading Concrete Mixers, Reaches Storage Piles in a 60-Foot Radius and Eliminates All Wheeling

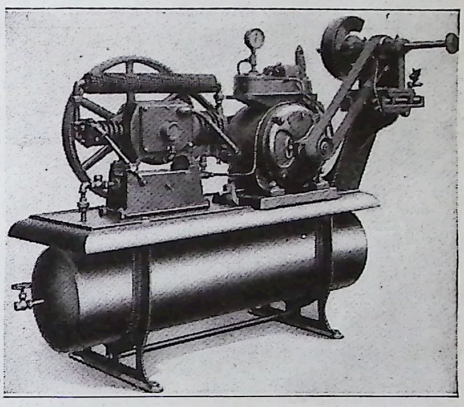
STREET-CAR WORK IS SHOWN UNSUITED FOR WOMEN

Hundreds of women for a number of months have been employed as guards and conductors by local transportation companies at New York. The attention of the Bureau of Labor Statistics was attracted and an investigation instituted. As a result of the first findings, it is announced that "the operation of street cars is one of the last occupations into which women should be lured or forced." The traction companies contend that the shortage of acceptable men, because of enlistments, the draft, and higher wages paid in other industries, has made it necessary to employ women. They deny also that women have been employed to effect a saving in wages. On the other hand, the government's report points out that while wages are not actually being lowered by the introduction of woman labor, it is altogether probable that this has prevented wages from increasing. Also, attention is directed to the fact that while the cost of living has advanced 47 per cent during the last four years, conductors who have served for 16 years and more have received salary increases amounting only to 26 per cent. The bureau's report goes on to show that women are temperamentally and physically unsuited for such work and cannot do it without endangering their health. Stress particularly is laid on the condition presented by the fact that many women have "night runs" in order to be able to look after their children and prepare the family meals.

The Apparatus Is a Combination of Measuring Bins and a Belt Conveyor Applied to a Portable Machine Operated and Transported by Its Own Power

CONSTRUCT AIR COMPRESSOR AND BUFFER IN ONE UNIT

For public garages and tire shops a combination air compressor and buffer has been developed. It is built as one



Automatic-Control Air Compressor in Combination with a Buffing or Grinding Head, Making Separate Installations Unnecessary

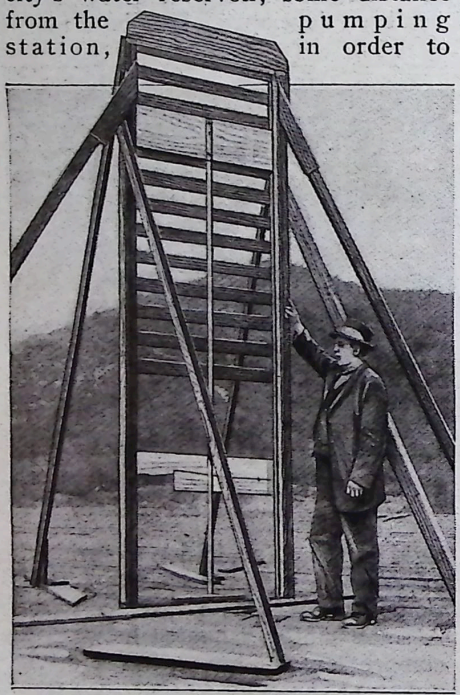
rigid unit and, in addition to saving the expense of making separate installations, has merit as a space conserver. A small motor, mounted between the compressor and buffer, has a driving pulley at each end so that the load is equally distributed. The buffer may be operated independently, or not, as is desired.

NEW DEVICE TO PROTECT SOLDIERS' EARDRUMS

A device for protecting soldiers' eardrums has been invented by American physicians, which is said to be superior to anything of the kind now in use. The character of the invention is a carefully guarded secret. While it cannot be depended on absolutely to prevent deafness, it is said that within a short time all of our men abroad will be equipped with protectors of this type. Existing devices are only partly satisfactory.

ENGINEER'S BIG INDICATOR SAVES MANY LONG TRIPS

To avoid daily trips to a western city's water reservoir, some distance from the pumping station, in order to



Indicator on Top of a Water Reservoir: Being Visible from the Pumping Station, It Saves the Engineer a Daily Inspection Trip

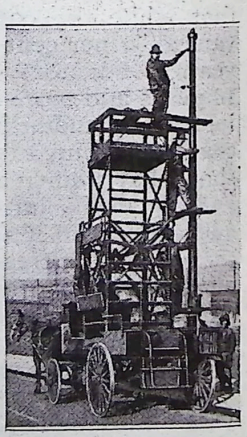
learn the amount of water on hand, the engineer in charge has erected a simple indicator above the reservoir. It consists of a frame, some 12 ft. high, clearly visible from the pumping station and divided by slats into spaces representing 10,000 gal. each. A float in the big container is connected by a vertical rod with a broad white board that rises and falls in the frame as the water level varies. Now the engineer at the station can tell at a glance the amount of water on hand.

EMERGENCY WAR TRAINING OF AEROPLANE MECHANICS

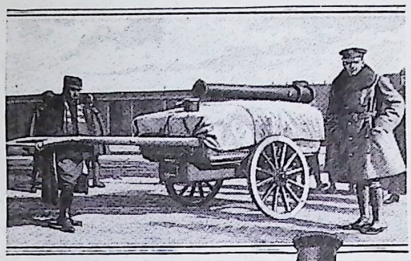
In connection with the emergency war training of aeroplane mechanics, engine repairmen, woodworkers, riggers, and others, the Federal Board for Vocational Education calls attention to the qualifications for instructors and for those desiring admission to classes. Prospective instructors should be good mechanics and have experience at government flying fields or commercial plants. Schools planning to conduct courses of instruction may be able to arrange for their intended instructors to obtain the required training at army schools or aeroplane factories. It is desirable, on the other hand, that the men who take the emergency courses should be experienced workmen. For woodworkers, cabinetmakers are excellently suited; for metal workers, bench work in a machine or sheet-metal shop is good preparation, and for aeroplane-motor repairing, motor-car enginemen and garage mechanics are best adapted.

TOWER WAGON IS EQUIPPED FOR POLE PAINTERS

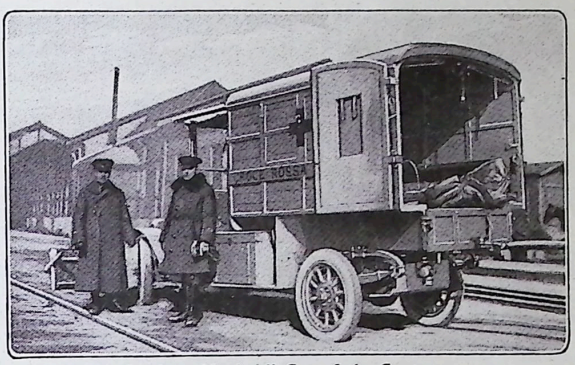
Special equipment for pole painters is provided on a tower wagon used by a surface-traction company in the West. It enables four men to work simultaneously on a 30-ft. pole without ladders, and consists of three platforms at different levels. At the top are two sliding planks, in the middle a folding L-shaped scaffold supported by struts, and near the bottom a similar hinged scaffold held by chains. Three painters are afforded convenient positions from which to work, while the fourth, standing on the sidewalk, takes care of the bottom part of a pole.



¶All gasoline intended for use by the French army is being tinted red in accord with an order designed to prevent the fuel getting into civilian hands by illegal means.



The Rolling Canteen as It Appears When on the Move: Soups and Drinks can be Kept Hot or Cold in This Outfit for Hours



This Truck Is the "Mother" Car of the Canteen, and Carries the Workers and the Supply of Provisions

A Rolling Canteen on the Italian Front, Ready for Service: One of the Containers is Shown in the Foreground

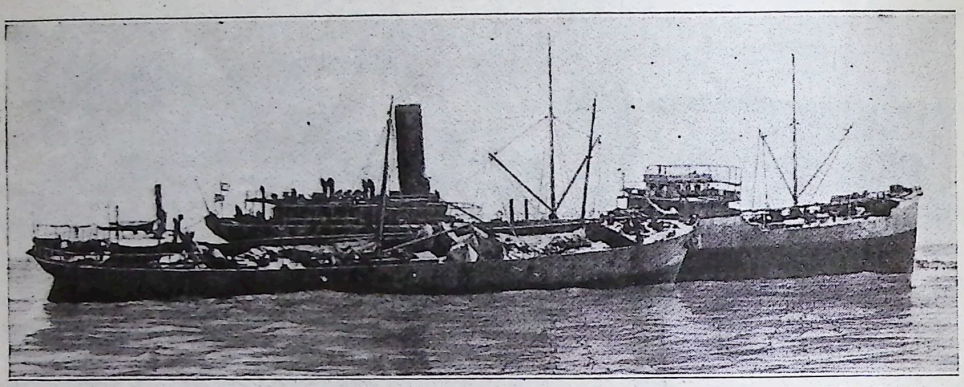
ROLLING CANTEENS SUPPLY DRINKS, HOT OR COLD

The rolling canteen, an improved field kitchen equipped to keep soups and drinks hot or cold for several hours, is now being used most effectively by the American Red Cross on the Italian front. The two-wheeled outfit can be drawn by hand almost to the fighting lines and from the big covered containers set in the top, hot or cold dishes or beverages can be served, according to the weather. Similar outfits on the French front have supplied over 400,000 drinks to soldiers in a month. The canteen is drawn, as a trailer, by a motor truck.

ROCK FROM CLEARED LAND MADE INTO A FLUME

The stones, which are a nuisance on much orchard land in western Colo-

An Almost Indestructible Irrigation Flume Constructed of Stone Cleared from Near-By Orchard Lands



A Barge Recently Grounded alongside a $1,000,000 Tanker, Which was Wrecked a Few Months Ago Exactly above the Remains of an Old Vessel, Similarly Unfortunate

rado, have been utilized to good advantage by one fruit grower in making an irrigation flume. Since they had to be cleared from the land anyway, they were collected along the route of a proposed ditch, and built into a substantial, rough trough, cement being used to complete the masonry. While wood and steel flumes deteriorate sooner or later and dirt ditches are far from permanent, this flume will stand indefinitely practically without repair, and will not be washed away by floods.

"STEERING WHEEL" DESIGNED FOR CARRIAGES

A device having a wheel and post like an auto steering wheel, for manipulating driving reins, has been designed for use in any horse-drawn vehicle. The reins are so connected with it that the horse, or team, is guided by turning the wheel to the left or right. With it a person can drive entirely with one hand and the driver's arms are never tired by overstrain. There is no danger of the reins being dropped accidentally, and in case of an emergency they can be quickly made taut.

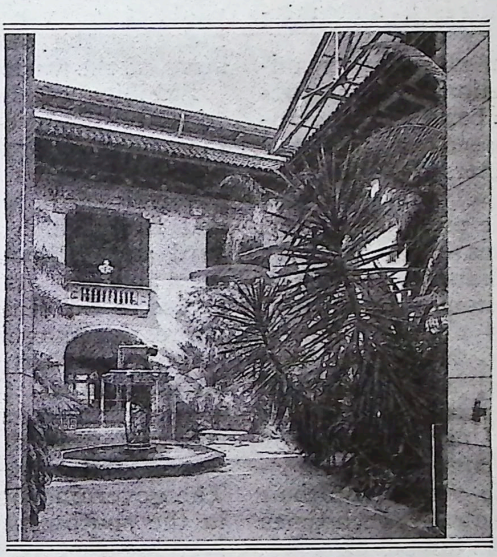
TAMPICO SEA WALL BRINGS MORE SHIPS TO GRIEF

The breakwater at Tampico, Mexico, has been the cause of an unusual series of misfortunes, the first two of which were noted in the February Popular Mechanics Magazine, which told how a new $1,000,000 tanker had been wrecked exactly above a steamer that came to grief on the breakwater years before. Following this coincidence by a few weeks, a tug towing two barges, attempted to enter Tampico harbor at night during a nor'easter, without a pilot. The forward barge struck guy wires, strung to steady the tanker which was still on the rocks. To prevent the tug being drawn onto the rocks, the barges were cut loose. The forward one was driven onto the breakwater alongside the tanker, doing considerable damage to the latter, while the other escaped this fate but was damaged somewhat when it struck its companion craft a glancing blow. When an attempt was made to float the first barge it broke into three pieces and sank, obstructing the channel still more. A few days later a crew succeeded in floating the tanker and docking it.

¶A recent report from the Navy Department stated that in response to its appeals, 42,000 pairs of binoculars, having a total value of about $3,000,000, have been placed at the disposal of our sea forces by patriotic citizens.

PAN-AMERICAN UNION MODEL FOR WORLD PARLIAMENT

IT is told that a British cabinet member, during an informal meeting of that body, recently declared that the present war would have been averted had there been established in one of the capitals of the old world a Pan-European union organized and controlled on the same principles as the Pan-American Union. On the other hand, had it not been for the influence of this international congress of American republics, under the wise leadership of its director, John Barrett, the United States would, perhaps, be at war with Mexico.



The Patio is Filled with Plants and Trees of Commercial Importance in the Western Hemisphere and Some of the Rarest Specimens of Tropical American Flora

Those who watch the trend of events and have studied the utterances of the world's foremost statesmen, of late, realize that the forces of democracy have for their goal the creation and maintenance of a world parliament of nations, modeled somewhat after the plan of the Pan-American Union, but endowed with the power of enforcing its decisions, when the questions of war and peace are involved.

All of which turns attention to the Pan-American Union, which, although of vital importance to the whole western hemisphere, is perhaps but little understood by the general public. Originally it was known as the Bureau of American Republics, but since 1910 it has born its present title.

Primarily its purpose is to promote closer trade relations among American nations and dissem-

The Pan-American Building Is One of the Most Beautiful Structures Open to the Public in This Country. It Is of Latin-American Architecture and Built of White Marble

inate reliable information of commercial character concerning the continental republics. It is in intimate association with government authorities and in close touch with commercial bodies, importers, exporters, manufacturers, shipping interests, and merchants.

Most important of all is the organization plan of the union, which is supported on a pro-rata basis. Its governing board is composed of the ambassadors and ministers of 21 nations, with the secretary of state of the United States as the presiding officer. It is this that makes it a real factor in the maintenance of friendly relations. Once each month, from autumn until late spring, these plenipotentiaries, representing nearly 200,000,000 persons, gather around a massive oval table in a special room provided in the Pan-American Union building at Washington and discuss frankly the issues that affect the welfare of their respective governments. At such times the ministers of little nations like Salvador and Uruguay have as much voice and voting power as any of the others present. Interesting light is thrown on the character of these unusual meetings by the executive officer of the union who, after attending them for nine years, says: "I have never known one of them to break up with the least discord or unkind feeling. I have, however, known many meetings to discuss frankly most delicate questions, and more than once action has been taken which has had profound influence upon the peace of the American nations."

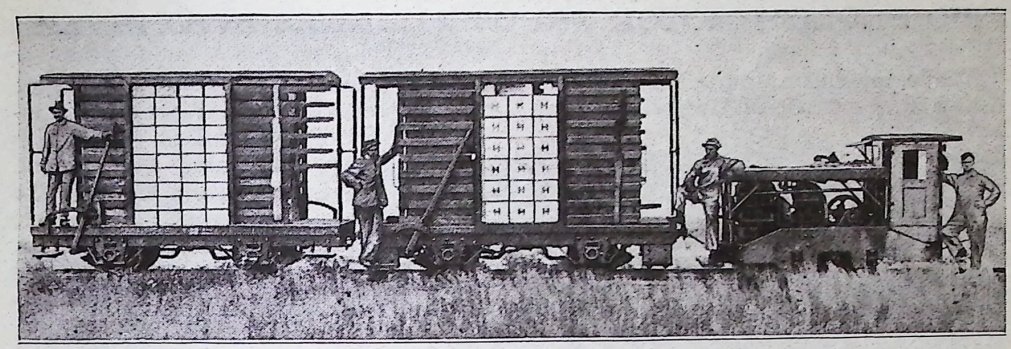
Visitors at the capital recognize the Pan-American building, which was dedicated eight years ago, as one of the most beautiful and impressive structures open to the public in this country. It is of Latin-American architecture and constructed of white marble. Its patio, which is a luxurious garden filled with plants and trees of commercial importance in the western hemisphere and some of the rarest specimens of the tropical American flora, is equipped with an electrically controlled, sliding glass roof which covers it, except during balmy weather. The national colors of the several republics illumine in turn the bubbling water of a fountain situated in the center of the court. The tile paving reproduces figures found in the floorings of Inca and Aztec temples, while under the cornice on the walls inclosing the patio are the coats of arms of the various republics.

Exhibits of Latin-American countries are displayed in a broad corridor that extends at the rear of the patio. Grand stairways on either side of the latter rise to a wide foyer on the second floor which overlooks the courtyard and is known as the gallery of flags and patriots. This corridor gives access to the Hall of the Americas, an impressive, magnificent salon, 100 ft. in length and 70 ft. wide, which is used for large international conferences and special ceremonies. From its deep windows is afforded a view of an artistic Aztec garden in the grounds outside. The governing board's room is located in the southwest corner of the building, the rest of which is given over principally to the Columbus Memorial Library, reading rooms, reception rooms, the offices of the union, and various private offices.

After all, however, it is the Pan-American Union, not the building, which is of chief concern in these troublesome times. It is the demonstrated influence of this remarkable parliament of the Americas that leads many thinkers to believe that the example it has set will pave the way for a World Union charged with the preservation of peace among all peoples.

GUNPOWDER IS SOLE CARGO OF ODD LITTLE RAILWAY

To those unacquainted with powder-mills, munition factories, and other plants where high explosives of various kinds are manufactured and handled, a little train used at a powder works in one of the western states would be a real curiosity at first sight. It consists of two foreign-looking little cars drawn by a mongrel locomotive that mounts a gasoline engine. The



Loaded in the Two Slat-Sided Cars Are 11,400 Pounds of Powder Bound for the Magazine. The Gasoline Locomotive is Designed to Eliminate the Danger of Flying Sparks

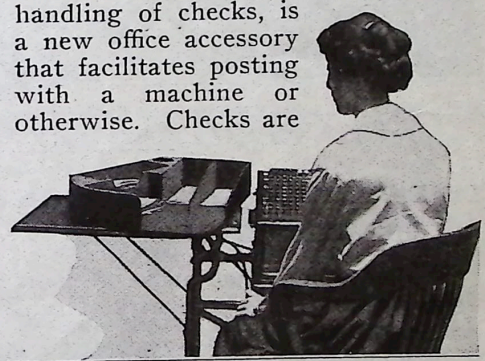
cars are no larger than fair-sized delivery wagons, while the engine is a squatty little thing similar in proportions to those commonly used by excavating contractors. The train operates between the packing house and magazine.

MARKS ON STREET CONTROL FOOT AND WHEEL TRAFFIC

What has been designated as "rotary-traffic" rules have been adopted at many busy street crossings in Washington, D. C. The plan involves the painting of two concentric circles at the street intersections, the larger one touching the curbs at the four corners. At each of the four places where pedestrians cross, two parallel paths are indicated by straight lines, each with a set of arrows to guide the foot traffic, the two sets of arrows pointing in opposite directions. Movable posts with heavy iron bases indicate safety zones, midway between the curbs in the footpaths, and within the inner circle. Arrows also show motorists the routes to follow so that each car can keep to the right, regardless of turns.

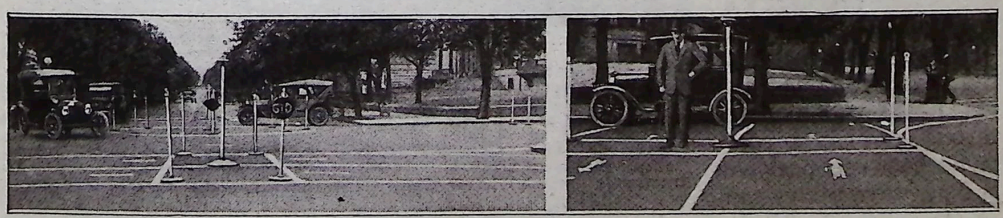
DIVISIONS IN CHECK TRAY CONVENIENTLY PLANNED

A compact tray, the compartments of which are arranged for convenient handling of checks, is a new office accessory that facilitates posting with a machine or otherwise. Checks are placed in the first compartment on the left, and as posted are transferred to the second division, while deposit slips are handled in the same way on the right side of the tray.



Because of Its Special Design It Is Very Easy to Handle and Keep Track of the Checks in the Tray at the Left, While Amounts are being Posted

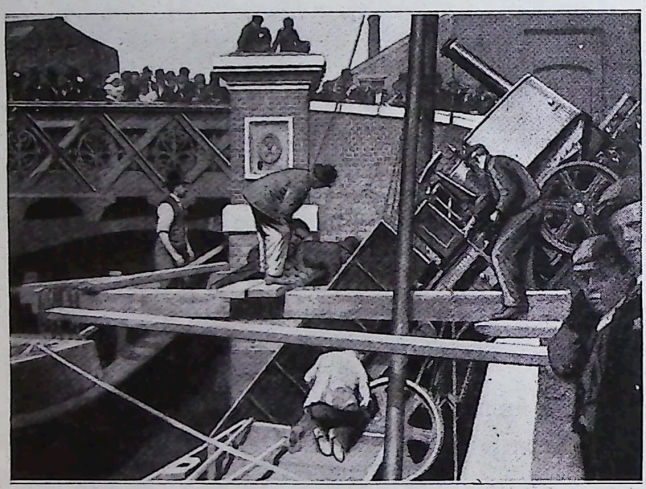
¶South African bamboo is a possible source of potash, and a survey of its distribution has been urged.



Left: General View of a Street Intersection Showing Footpaths in Foreground and Two Automobiles Moving in Opposite Directions around a Central Zone of Safety. Right: Parallel Paths for Pedestrians, across a Washington Street with an "Island of Safety" Indicated by Iron Posts

BIG ENGLISH MOTOR TRUCK PLUNGES INTO RIVER

While making a sharp turn with a heavy motor truck of English design, the driver lost control of his engine and the vehicle backed over a retaining wall in an English city and fell several feet into a stream. To recover the big vehicle was a difficult task. A scow was anchored alongside and scaffolding was erected extending from the craft to the retaining wall. Then, with the aid of a stout crane and a traction engine the load was slowly lifted until a platform could be extended beneath the rear wheels, whereupon the big truck was easily hauled back onto the river bank.



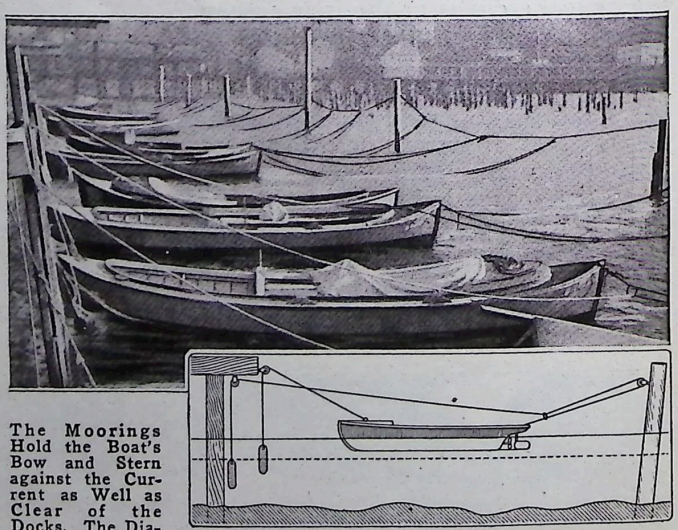
Motor Truck of English Design being Hauled from a River into Which It Backed When the Driver Lost Control of the Engine

TINY THREADS A FEATURE IN BATTERY INSULATION

By imbedding thousands of short threads transversely in sheets of rubber, a storage-battery manufacturer believes that he has produced an effective and durable rubber insulation to place between the plates in motor-car batteries. Separators of this sort, it is claimed, are preferable to those of solid rubber, for they do not prevent the free circulation of the electrolyte, the threads acting like wicks that draw the solution through the walls. At the same time there are no holes through which a contact between positive and negative plates can be established. Each insulator contains 196,000 of these little threads.

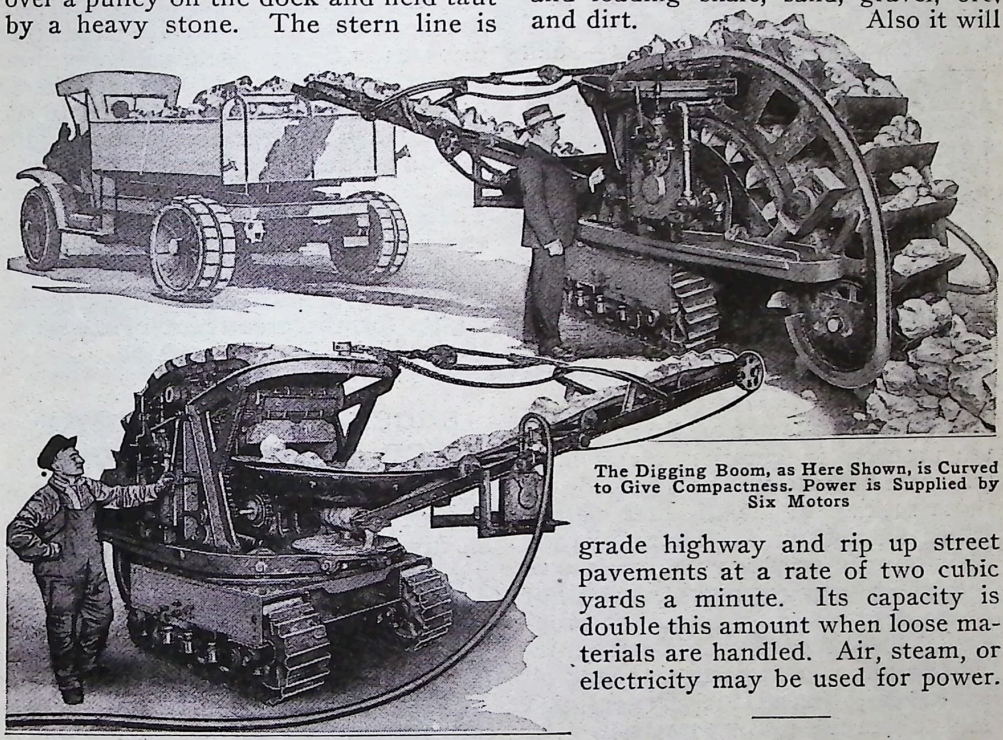
MOORINGS PREVENT INJURY FROM WAVES AND TIDES

To prevent their boats from being damaged by the waves and tides, Columbia River fishermen have developed a mooring which holds bow



The Moorings Hold the Boat's Bow and Stern against the Current as Well as Clear of the Docks. The Diagrammatic Sketch Below Shows the Arrangement of the Mooring

and stern against the current and eliminates bumping the docks. Each boat is moored at the bow by a line passing over a pulley on the dock and held taut by a heavy stone. The stern line is fastened to a pulley on a pile and is also weighted with a stone swung from the dock.



The Digging Boom, as Here Shown, is Curved to Give Compactness. Power is Supplied by Six Motors

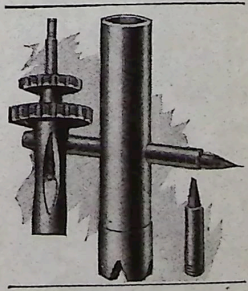
Showing the Discharging Conveyor Operating at Right Angles to the Digging Boom

FAST-WORKING POWER SCOOP OPERATES ECONOMICALLY

Large capacity coupled with low operating cost and wide-range utility add punch to the interest that a new digging and loading machine attracts because of the novelty of its design. The latter element is due largely to the shape of the boom, which is curved to give compactness. Creeper treads carry the weight of the machine, while the shovel is mounted on a turntable so as to swing in a half circle and make a cut of more than 15-ft. width. The claim is made that the equipment will dig and load coal from its natural deposit at a speed of two tons a minute without requiring any blasting. In addition to being suited for work of this character, it is used for digging and loading shale, sand, gravel, ore, and dirt. Also it will grade highway and rip up street pavements at a rate of two cubic yards a minute. Its capacity is double this amount when loose materials are handled. Air, steam, or electricity may be used for power.

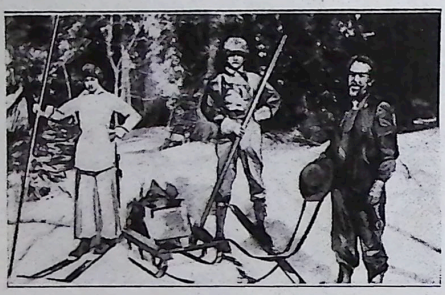
MANY FUNCTIONS COMBINED IN VALVE-REPAIR TOOL

Five different kinds of work can be done with a three-piece valve-repair outfit designed for motorists. The largest member consists of a cylinder notched at one end and threaded on the inside for recutting outside stem threads. The opposite end is used in turning hexagonal nuts. A second part has a conical threaded head useful in removing broken plungers. A shoulder near the end is employed in reaming off rough nipples. A third tool, also used in removing broken plungers, has a sharp, wedge-shaped point.



BRAVE DANGERS AND COLD TO WIN TIMBER LANDS

Because the law requires that purchasers of government timber land—when such is offered for sale—shall



Prospective Buyers of Government Timber Land on Their Way to Inspect the Property, as Required by Law

swear that he has personally inspected the property in question, many hard and even hazardous trips are made by those seeking to file the first claims. When an area in the Sierra Nevada Mountains in northern California was opened up, many persons started out in the dead of winter to see the property. The prospective claimants, including men and women, traveling on snowshoes, braved the dangers and cold to win the coveted tracts.

OLD STEAMER A LOOKOUT FOR FOREST RANGERS

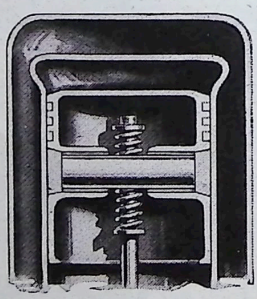
The building of a railroad in the vicinity of Lesser Slave Lake, in Alberta, Canada, made it unprofitable longer to run the lone steamer in those waters, but it did not end the vessel's usefulness. Some time after it was beached forest rangers were assigned to the district, and they were quick to seize upon the old craft as a most satisfactory lookout and headquarters.

PROPOSE AERIAL HOSPITALS FOR PHTHISIS CURE

Establishment of aerial hospitals for the treatment of tuberculosis and other diseases is being discussed by medical authorities in England. A special corps of physicians is to be attached to the new British Air Service, formed by the consolidation of the Royal Flying Corps and the Royal Naval Aviation Service. These practitioners will make a close study of the effect of great altitudes on the human system. In connection with this work the feasibility of using air flights for the treatment of consumption will be investigated.

SHOCK-ABSORBING PISTON FOR MOTOR-CAR ENGINE

In attempting to effect further refinements in modern gasoline motors, an inventor has originated an equalizing piston. Instead of being rigidly fixed, it has a spiral spring around the connecting rod. The wrist pin rests on this and has at its center a hole through which the connecting rod is free to pass. The purpose of the cushion arrangement is to lessen engine vibration and give greater smoothness of operation. This it is supposed to do by partly absorbing the shock produced by the force of the explosion striking a rigid piston a sledgelike blow. The spring also is designed to prevent knocking and loss of power when explosions occur before the piston reaches dead center.



¶The first trip in connection with the aerial postal service, recently established between England and France, was made in a flying boat which flew from Paris to London and back in three hours and 10 minutes.

Planting Small Clams on the Flats near the Mouth of the Merrimac River: The "Seed" is Placed in the Furrow Made by a Hand Cultivator and Then Covered Over. A "Crop" is Expected in Two Years

FIFTEEN ACRES OF LAND PLANTED WITH CLAMS

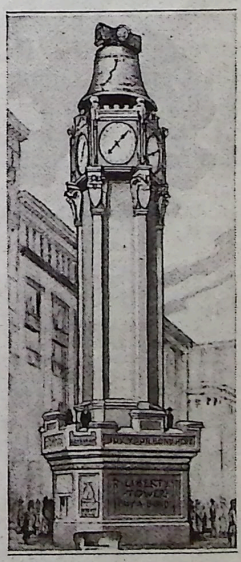
Planting clams has recently been undertaken on flats near the mouth of the Merrimac River, in Massachusetts, much as the farmer plants his corn. In recent years the supply of these creatures obtained from this land has been greatly reduced and, following successful preliminary experiments, the city of Newburyport decided to "reseed" 15 acres with 55 bbl. of small clams. These will mature in two years, and in the meantime no digging will be permitted in the tract. The method followed was to plow furrows with a hand cultivator, followed by men who dropped "seeds" in place and covered them over.

PLAN HOSPITALS TO TREAT SHELL-SHOCK VICTIMS

Experts in mental and nervous diseases in this country are already making plans for a chain of hospitals for the treatment of shell-shock victims. It is estimated that 90 per cent of this type of war sufferers can be cured; rest, pleasant surroundings, good food, and plenty of sleep being essentials in the treatment. It has also been found beneficial to teach the victims to sew, knit, paint, etc. It appears that early in the war the French made the mistake of returning to the front the men who had been treated for shell shock, and it was found that they were ill-fitted to stand the strain put on them.

FOUNTAIN TAKES ON MANY ASPECTS DURING WAR

The monument known as Lotta's Fountain, in a busy district in San Francisco, has been camouflaged in numerous ways of late to help various war causes, taking on the aspect of a crow's nest, a fort, a battleship, etc. More recently it appeared as a Liberty Tower, surmounted by a replica of the Liberty Bell and supporting a clock, the dial of which was so equipped as to show, in round numbers, the hourly progress of the city's third Liberty-loan campaign.



FATE OF HUN'S ZEPPELINS SHOWN BY STATISTICS

It must be self-evident to observing persons that Germany's much-flaunted Zeppelin flotilla has been a dismal failure in a military capacity. But the far-reaching extent of the failure may not be so apparent. The fact is that the defeat of the Zeppelin has been a colossal one. Here are some figures that throw interesting light on the question:

Four of the big ships have been destroyed outside of the war-zones, 16 have met with fatal accidents, and 18 have been felled. The fate of eight others is somewhat in doubt, but most, if not all, of them are thought to have met disaster. Three Zeppelins are now used as training ships; 11, some of them of other types, are supposedly in service, and four have been stripped and discarded.

It is well to call attention to the fact that many of the numbers indicated in the list that follows have been borne by other German dirigibles. The original practice was to replace a destroyed ship with a new one bearing the same serial number. Incidentally, the manufacture of Zeppelins apparently has been discontinued, for, according to the Frankfurter Zeitung, the German Airships Company "is devoting itself to a new field of work."

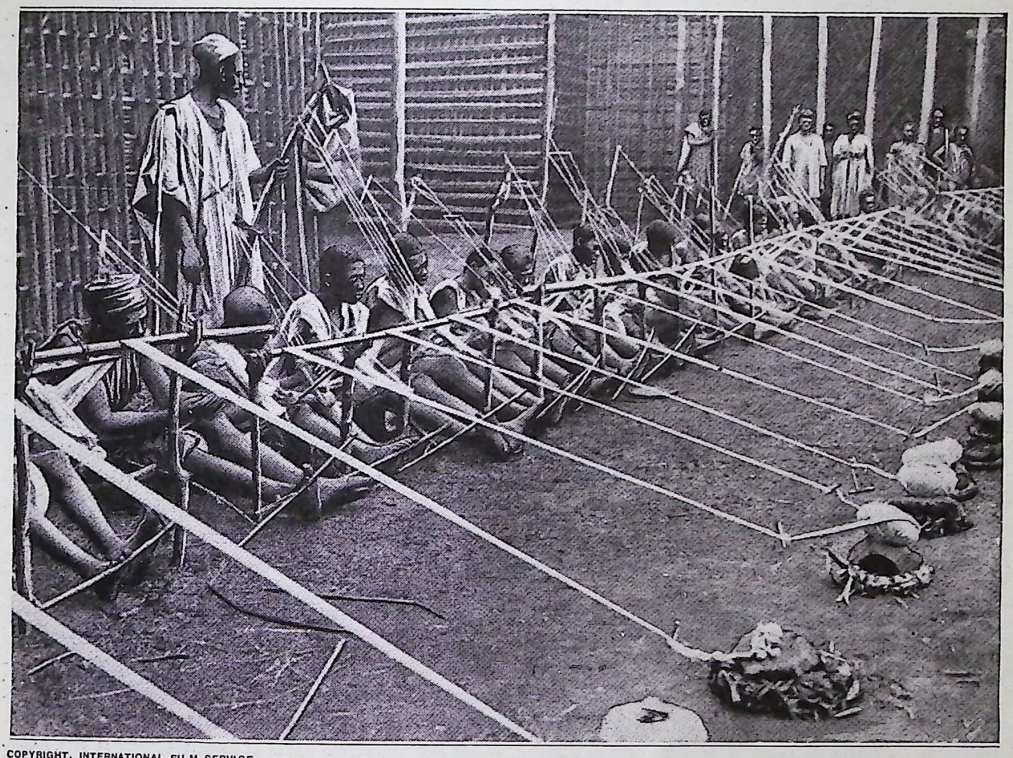
Here is a detailed account of what has happened to the flying sausages:

L-1. Destroyed before the war in the North Sea near Helgoland.
L-2. Burned before the war.
L-3. Forced to descend in Denmark at outset of war. Destroyed by crew.
L-4. Forced down in Denmark and demolished by crew.
L-5. Shot down in Belgium, 1916.
L-6 and L-9. Burned in their hangars at Mühlsbüttel, Germany, September, 1916.
L-7. Shot down by English destroyers off the coast of Jutland. Crew lost.
L-8. Shot down by machine gun in Belgium, late in 1916. Part of crew killed.
L-10. Struck by lightning near Cuxhaven on one of its first flights. Total loss.
L-11. Stripped, 1917. Out of use.
L-12. Destroyed at Ostend on its return from England, 1915. Crew saved.
L-13. Stripped. Out of service.
L-14. Used as school ship at Nordholz.
L-15. Shot down in the Thames in 1916.
L-16. Destroyed Oct. 19, 1917, in the sea.
L-17. Destroyed in the sea.
L-18. Burned in a hangar at Tonderen, 1916.
L-19. Fell into the Baltic Sea on its return from England.
L-20 and L-21. No longer in existence. One of these two is said to have been burned at Tonderen at the same time as the L-22, which accidentally took fire in passing out of its hangar.
L-23. Fell on the English coast.
L-24. Not in existence (?)
L-25. Practice balloon, destroyed. Equipment of this dirigible bore the numbers L-26, L-27, L-28, and L-29, of which there is no record.
L-30. School dirigible used in the Baltic.
L-31. Shot down over London in 1916.
L-32. Brought down over London, Sept. 23-24, 1916.
L-33. Brought down in England, Sept. 22, 1916. Crew interned.
L-34. Brought down in England.
L-35. Practice balloon at Wildpark, near Berlin.
L-36. Brought down in England.
L-37. Attached to the Baltic fleet. May be destroyed.
L-38. No record.
L-39. Shot down at Compiègne, March, 1917.
L-40. Fell in the Emden woods.
L-41 and L-42. Obsolete types in service in the North Sea.
L-43. Brought down at Terschelling.
L-44. Brought down in flames at Saint-Clément, Oct. 20, 1917.
L-45. Burned at Sisteron, Oct. 20, 1917.
L-46 and L-47. In service in the North Sea.
L-48. Shot down in England in June, 1917.
L-49. Brought down at Bourbonne-les-Bains, 1917.
L-50. Fell at Dammartin, Oct. 20, 1917. Crew captured. Part of equipment recovered.
L-51 to L-56. In service on the North Sea.
L-57. Destroyed during its trial trip, October, 1917.
S-L-3. Out of service.
S-L-4. Struck by lightning in the Baltic.
S-L-6. Fell into the Baltic Sea.
S-L-8. In service on the Baltic Sea.
S-L-9. Burned at Stelp.
P-L-19. Destroyed in Russia.

Machines of the "S-L" series are rigid craft of the Schütte-Lanz type. "P-L" stands for Parseval dirigibles, which are of semirigid, or flexible, construction.

CAPRONI CRAFT FOR YANKEE AIRMEN IN FRANCE

According to apparently reliable information, it is understood that Caproni biplanes are to be built in this country for the use of our airmen in France. The machines will be modified to meet the requirements of the Liberty motor and employed as night-bombing craft. For work of such character no existing machine is better suited than the Italian Caproni, which has unsurpassed lifting power and wide radius of action. Experience with big machines of this type will undoubtedly influence the after-war use of large commercial planes in this country.



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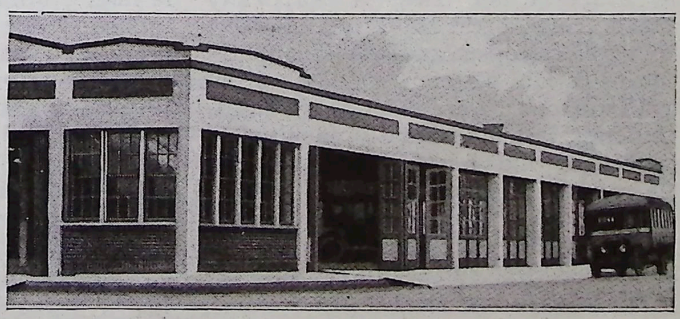
GERMANY LOSES LAST OF ITS AFRICAN POSSESSIONS

WITH the seizure of Kamerun, Germany has lost its hold in Africa. This colony, because of its geographic position, was easy prey for the allied forces, although it was the last of the kaiser's possessions to hold out. The picturesque photograph of the dusky-hued native weavers reproduced above was taken in Fumban, a thickly populated part of Kamerun.

"SELF-EMPTYING" GARAGE REDUCES FIRE HAZARD

To diminish the fire risk, a motor-bus company operating in one of the western cities has built a garage that is not only fireproof in construction but also self-emptying. The structure covers a square block of ground and is supplied, along each of its four walls, with a series of folding doors. Its concrete floor slopes from the middle toward the exits and joins the ramps that give access to the bordering pavements. Only a moment is required to open the various doors, in line with which the machines are placed except when undergoing repairs. By releasing their brakes, in case of fire, the cars will consequently move by gravity out of the building.



Each of the Four Walls is Supplied with a Series of Folding Doors toward Which the Floor of the Garage Slopes. This Arrangement Enables All Cars to be Removed from the Building Quickly, or Even Automatically by Gravity

TRICK FLYING THE FORTE OF FIGHTING PILOT

IN pre-war days airmen such as Gustave Hamel and our own Lincoln Beachey, who thrilled thousands by beating the birds in skylarking flip-flops, were looked upon as foolhardy dare-devils who contributed little or nothing to aeronautic progress. In truth they were the pioneers in aerial acrobatism, now dignified as the science of aeronautic military maneuvers.

The successful pilot of a fighting plane today is the birdman who is so literally a birdman that he puts his machine through all sorts of gymnastics instinctively and devotes himself chiefly to the business of fighting. His craft must be a living part of him, responsive instantly to his demands. And in combat, these demands are severely exacting.

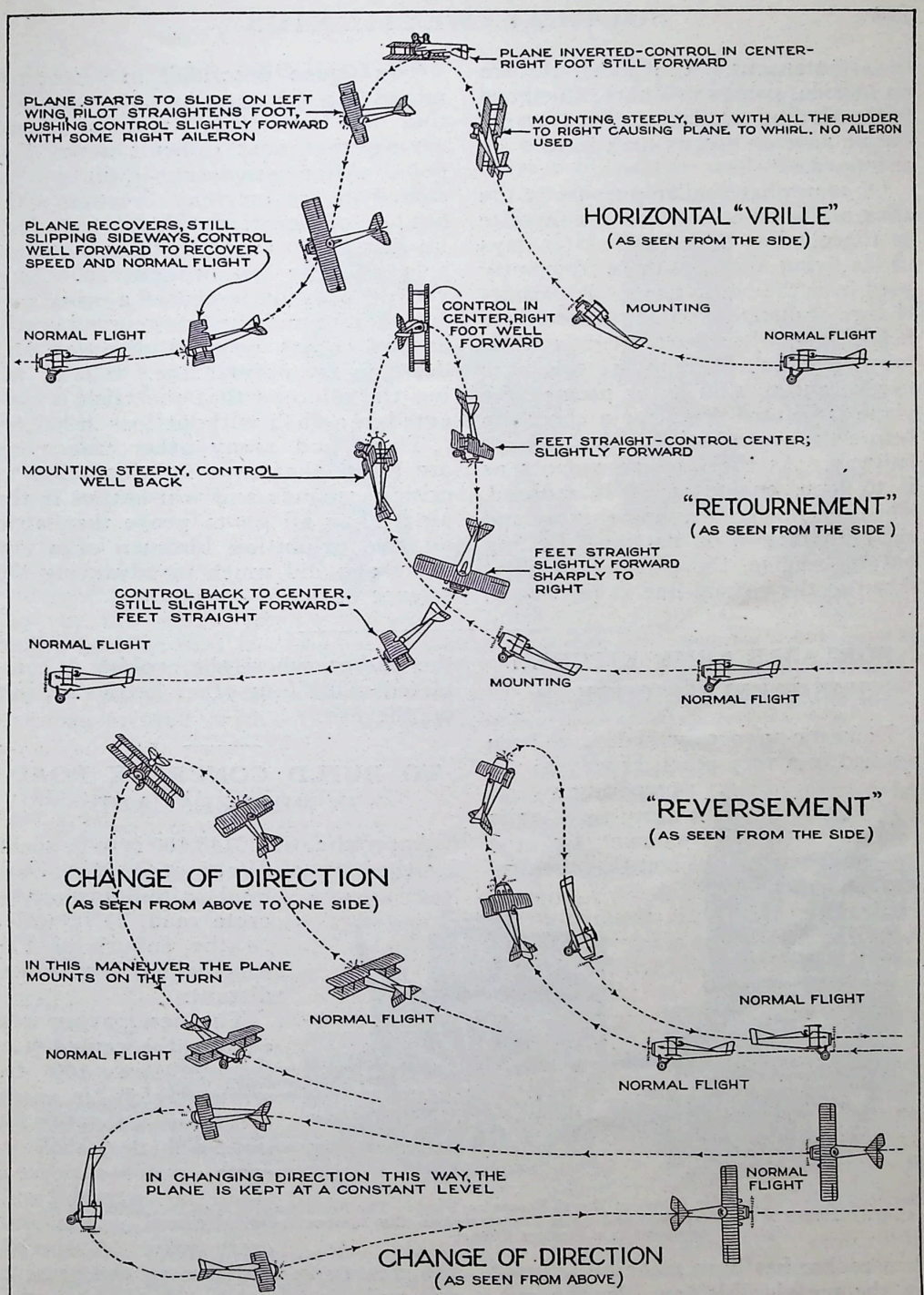
There are tricks that win battles and tricks that are suicidal. Also there are tricks worth knowing and avoiding. Among the latter it is somewhat surprising to find looping the loop mentioned. Although valuable occasionally in righting a plane, the maneuver exposes the pilot to his enemy, prevents him from firing for the moment, and is liable to put his machine gun out of commission. The war offers a few examples of notable exceptions to the rule. Two or three Huns have been accounted for by pilots who have suddenly changed from fugitive to pursuer by a quick loop. But the caper is considered poor technique when dueling. Likewise the tail slide, unrivaled as a spectacular trick, is practically taboo. Such a feat subjects a machine to undue stresses and too frequently means certain disaster. A plane fitted with ailerons, as are most of the fighting craft, is fundamentally unsuited to withstand the reversal of pressure. One with warping wings, if strong enough, may come through safely, providing the pilot keeps his head. Inasmuch as performance of the feat depends upon full reversal of the controls, and participation produces a nauseating sensation, a pilot is in danger of becoming bewildered at a critical moment. These things combine to make tail sliding uncommon in war.

Tricks in flying are a good deal like tricks in swimming. Until one has dived from fair heights, swum under water with eyes open in quest of pennies tossed into a pool, and made shore in a storm after capsizing with a catboat a mile out, he doesn't begin to know the meaning of real self-confidence.

So is it with the airman. After successfully performing a few breathless whirligig capers he gains a sense of mastery that months of conservative flying could not instill in him. Thus the sensational "vrille" is the first trick taught student pilots of the swiftest Nieuports when they enter one of the famous French schools of acrobatism for their final training. After doing this difficult feat two or three times, an airman is either eager for other gymnastic frolics, or thoroughly cured of all desire to pilot a "chasse" plane.

The vrille, often mentioned in dispatches, is undertaken by the pupil at an altitude of about 2,600 feet. While flying on a level, he throttles the engine, draws the control lever suddenly back and to one side, and simultaneously makes a quick forward movement with the foot on the corresponding side. The craft rockets upward, begins to stall, and with a spiral wrench turns to the side. The controls are centered at the outset of the sharp twisting motion. The lever is then gradually moved forward a few inches. The craft plunges straight down and, as the lever is pulled back, straightens out. The power is opened up and flight is resumed in the same direction and at the same elevation as at the beginning.

Another valuable maneuver is quick change of direction without reduction of speed or change of elevation. It is accomplished when flying straight at top speed by throwing the control lever full to the side and quickly rearward, at the same time applying soft pressure with the opposite foot. Response



The War has Vindicated Trick Flying. It has Proved That Aerial Flip-Flops Teach a Novice More in a Few Weeks than He could Acquire by Months of Conservative Driving. The Diagrams Above Explain the Character of Some of the Important Gymnastic Feats Familiar to Most Military Pilots

BY COURTESY OF FLYING

is instantaneous. The plane, thrown on its side, swings in a horseshoe bend with startling suddenness, and comes out on an even keel as the controls are redressed.

Of somewhat similar purpose is the trick of "reversement," once a favorite of Lincoln Beachey's in the later days of his flying and now quite frequently used over the battle fields. It permits change of direction without sacrifice of height and, when deftly negotiated, is very graceful. Maximum speed is needed and to gain it the nose of the plane is pointed down for a short dip before the control stick is drawn back halfway. As the machine mounts as if to loop, engine speed is reduced. Then the rudder is swung sharply and the craft thrown on its side. Letting out the engine, the plane is brought down to the normal line at full speed.

The figure described in "retournement" has a beginning somewhat like that of "reversing," and is classed among the most difficult aerial flip-flops. After completing it, flight is resumed in the original direction without loss of elevation. The plane swings up at a sharp angle, is thrown on one side, and the tail brought up. As a vertical position is neared a quick spin is produced and the craft curved neatly around to its original direction and down to the normal line. It is by using the ailerons that the trick is executed in a flash without loss in height.

These and many other maneuvers are tricks that save fighting pilots in critical seconds and win battles in the air. They all go to prove that, after all, the exhibition birdmen of a few years ago did much in advancing the science of aerial navigation.

PORTABLE ARMY KITCHEN HAS FIRELESS COOKER

Domestic-science methods have been applied in a very practical way to the preparation of army food, as is shown by the fact that the fireless cooker has been made an adjunct of the portable kitchen. In the outfit illustrated, in which food for 480 men can be prepared at one time, the four boilers are heated at once. When ready, they are removed and placed in fireless-cooker containers housed in the limber, where the cooking is completed while four other kettles are put on the fire.

Portable Kitchen Outfit for Army, or Naval Forces on Land: The Food is Partly Cooked in the Rear Unit and Then Transferred to the Limber Which is Equipped as a Fireless Cooker

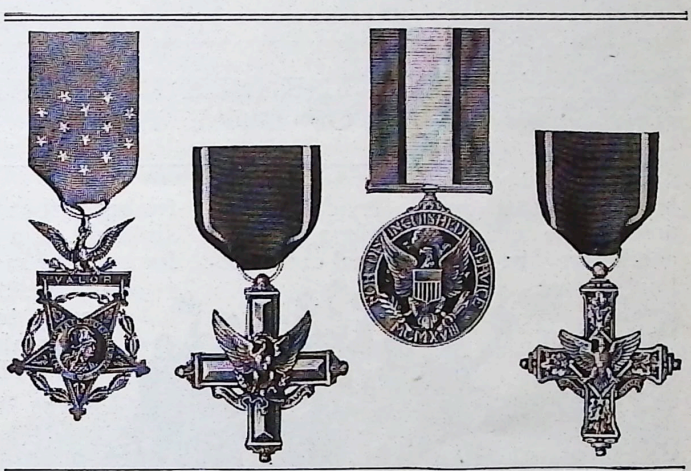
TO BUILD CONCRETE ROAD IN NEW ZEALAND

Approximately $146,000 is to be spent by the city of Wellington, New Zealand, in building a concrete road, 25 ft. wide, to the suburb of Petone, which is six miles distant.

The new paving will occupy the center of a thoroughfare 100 ft. wide which is now macadamized. Only light vehicles, such as carts, motor cars, and small motor trucks, will be allowed on the concrete way. A special vehicle tax in addition to the present one, will be levied by Wellington, the proceeds of which will be devoted solely to the upkeep of this road. This tax applies to all motor-driven cars, and among them are also included motorcycles.

AMERICAN WAR DECORATIONS FOR VALOR AND SERVICE

America's war-service decorations, consisting of the Medal of Honor, the Distinguished Service Cross, and the Distinguished Service Medal, are shown in the accompanying illustrations. The latter two are the new decorations announced by the War Department and reported in this magazine a short time ago. The Medal of Honor, a star of five points encircled by a wreath of laurel and bearing in relief the head of Minerva, is conferred by the president in the name of congress. The first issue of the Distinguished Service Cross was ornamented with oak leaves. This has been redesigned and a plainer decoration provided, as is explained by the photographs. The Distinguished Service Medal ranks third in importance, and like the cross is cast in bronze.



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Extending from Left to Right, the United States Military Decorations Reproduced Above are Designated as the Medal of Honor; the Distinguished Service Cross, Second Issue; the Distinguished Service Medal, and the Distinguished Service Cross, Discontinued Issue

SMOKELESS FUEL BRICKS MADE FROM SAWDUST

A synthetic hard coal is now being made from sawdust by a process that has been developed in Canada to utilize sawdust which is now wasted—estimated at several thousand tons daily in British Columbia alone. While this man-made coal is not being produced commercially, as yet, it is estimated that the cost of manufacture is about $3 per ton, three tons of sawdust being required for one ton of fuel.

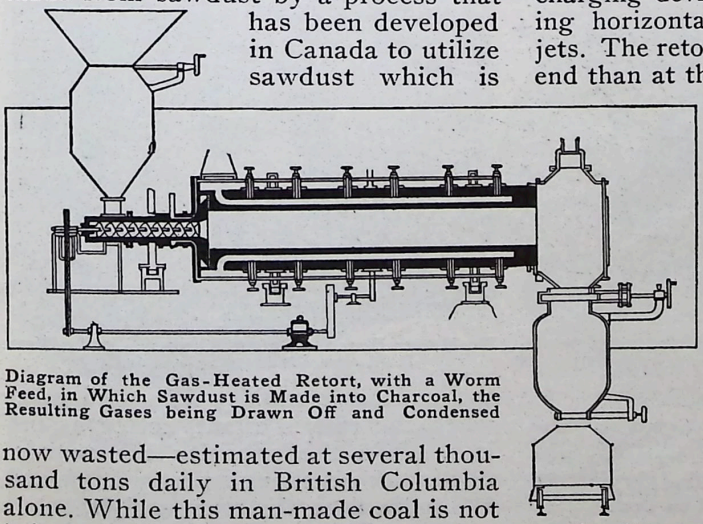


Diagram of the Gas-Heated Retort, with a Worm Feed, in Which Sawdust is Made into Charcoal, the Resulting Gases being Drawn Off and Condensed

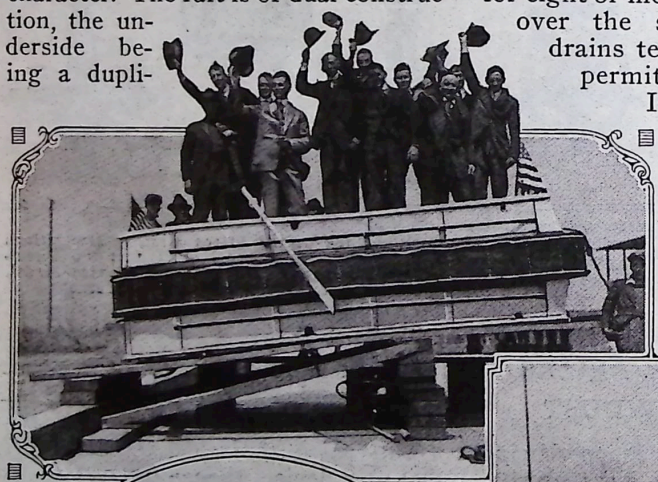
The sawdust is delivered into a charging device, thence into a revolving horizontal retort, heated by gas jets. The retort is slightly lower at one end than at the other, and by the time its contents reach the lower end it is made into charcoal. While this change is taking place, considerable moisture and gas are given off which are condensed into a distillate consisting of a tar, turpentine, rosin, etc. From the retort the charcoal passes into a container to cool.

The next step is to convey it to a mill that grinds it, mixing in crude oil or some of the products condensed from the gases referred to. The

plastic charcoal is now pressed into bricks that are baked so as to be made into a smokeless fuel. This is done in a portable retort into which hot gas is pumped. Much of the gas drawn off during the baking is condensed, leaving fixed gas which is heated and forced back into the retort to help continue the process. The fuel obtained by this means is said to contain 90 per cent of fixed carbon, seven per cent volatile gases, and three per cent ash.

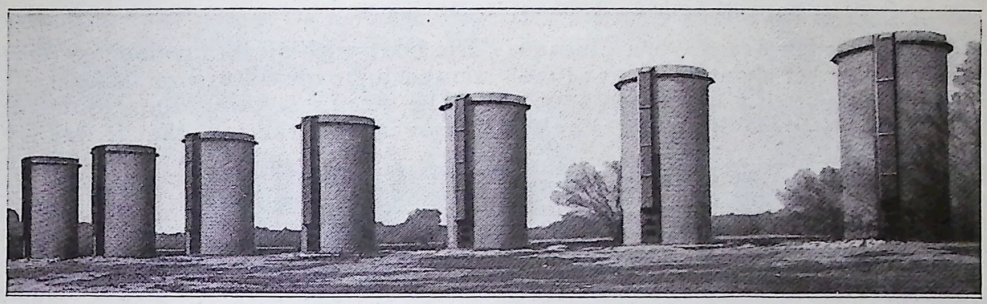
UNSINKABLE LIFE RAFT OF DUAL DESIGN

Numerous desirable features have been combined in a new type of life raft, recently launched, that make it distinctive among the many inventions of this character. The raft is of dual construction, the underside being a duplicate of the upper side so that, no matter how it is thrown into the water, a "right side" floats uppermost. Above and below a central framework of heavy timbers, that makes it practically unsinkable, is a low wall encircling seats for eight or more. Water which washes over the side flows off through drains terminating in valves that permit an outward flow only. In the center of the raft are two large metal cylinders, one in the upper side and one in the lower side, placed end to end, the adjacent ends being open and the opposite ends closed. The cylinder in the underside rapidly fills with water when the raft is afloat, acting as ballast, while the opposite one remains filled with air though partly immersed, and helps keep the craft upright. Oars are provided and there is storage space for provisions.



The Top View, Taken Just before Launching, Shows the Dual Construction of the Life Raft, the Lower Half of Which Is Identical with the Upper Half. Below: Testing the New Invention. The Man in the Center is Seated on One of Two Cylinders Which Are a Special Feature of the Craft

No Matter How the Raft is Thrown into the Water It Always Floats "Right Side Up"



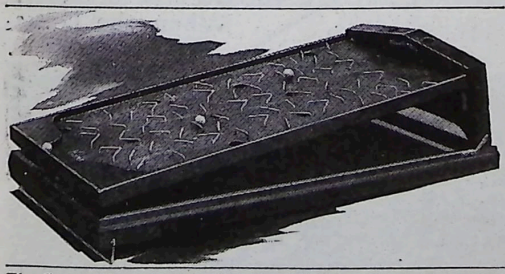
Seven of 21 Concrete-Stave Silos Built by a Rancher Who Believes That Food will Play a Big Part in Winning the War: Striking Evidence of Preparations being Made for Extensive Stock Raising on One Texas Ranch

TWENTY-ONE BIG SILOS ON TEXAS RANCH

Striking evidence of America's agricultural preparation for big food production in 1918 is found in a battery of 21 concrete-stave silos recently completed on a Texas ranch. These mammoth cylindrical storehouses are for sorghum ensilage to be used as winter feed for cattle that roam vast pasture lands most of the year.

GAME PLAYED WITH BALLS AND TILTED BOARD

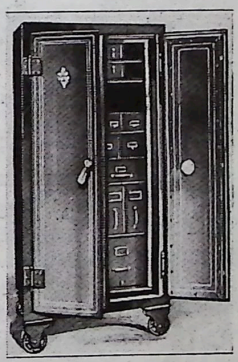
Skill and alertness are called forth in playing a new game which consists in trying to roll each of six billiard balls in turn down an inclined board in which are several holes and fastened to which are numerous wire obstructions. The board is pivoted so that it can be rocked sideways, and only by careful tilting back and forth can each ball be released from the well in which it is deposited and rolled the length of the board. The highest score is made by the person dodging the most holes.



The Game Played with This Board Consists in Rocking It So That Billiard Balls Started at the Top will Escape the Holes as They Roll Downward

STRONG SAFE MADE LIGHT WITH SPECIAL FILLING

Light weight and strength sufficient to withstand falls and great heat have been combined in an office safe of new design, which also serves as a filing cabinet. While the framework is very strong, lightness is obtained by using a special filling in the 3¼-in. fire walls. This filling is made according to a special formula and includes kieselguhr, a deposit of fine siliceous powder, which is combined with asbestos and durable binding mediums.



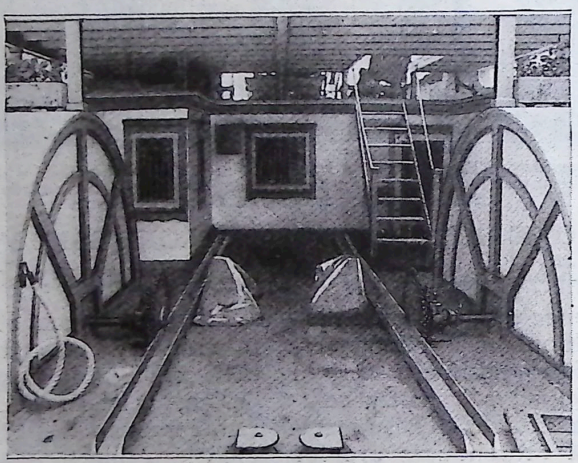
RIBBONS ARE SUBSTITUTED FOR IRON CROSSES

In Germany iron is so scarce that enough cannot be spared to make all the iron crosses needed to carry out the government's policy of wholesale distribution of war honors. At least such a condition is strongly indicated by a souvenir from a battle field that has been received in this country. It is a black and white ribbon which the sender, a medical officer, asserts is one of many that have been awarded in lieu of crosses. The ribbon was found on the body of a dead enemy.

HOUSEBOAT TRANSFORMED INTO A BUNGALOW

By ROBERT H. MOULTON

WHEN, a few years ago, a Chicago banker set about the task of designing for himself a houseboat which should be different from all similar crafts, he probably little dreamed that he was laying the foundation of what eventually would be one of the most original and artistic bungalows to be found anywhere.



The Houseboat was Propelled by a Motor Car. Grooved Runways were Provided on the After Deck so That the Machine could be Driven into Proper Alinement without Unnecessary Trouble

To begin with, the houseboat was a floating palace in miniature, possessing all the advantages of a modern steam-heated apartment. It had a large combined living and dining room, three bedrooms, a kitchenette, a well-appointed bathroom, the usual closets, and a 16 by 50-ft. roof garden. The craft itself measured 16 ft. in width by 75 ft. in length, with large decks both fore and aft, and the interior decorations, all specially designed, carried out the idea of weather-beaten, water-washed driftwood. The boat with all its furnishings represented an expenditure of $25,000.

The strangest thing about this boat, however, was the fact that it was propelled by automobile power. By means of grooved runways, the owner would guide his high-powered car onto the after deck, and there hitch the engine to the paddle wheels of the craft through the medium of sprockets attached to both the rear hubs of the car and the ends of the paddle-wheel shafts. The rear axle of the car was then jacked up so as to lift the tires clear of the deck, the engine started, and away the boat would move at a speed of five or six miles an hour. In this way the owner of the houseboat combined the pleasures of travel on the water and of motoring over the country roads, since it was an easy matter to moor the boat and run the automobile ashore whenever the spirit moved.

When the house-

The Boat Possessed All of the Conveniences of a Thoroughly Modern Apartment. It Measured 16 by 75 Feet, and was Supplied with Generous Decks at Either End and a Spacious Upper Deck

boating season came to a close, the owner of the boat would have the craft, which he called the "Driftwood," hauled up on the lawn of his home, its winter quarters. Then, when electric light, telephone, and other connections had been made, it formed as cozy a little home as one could desire. So well, indeed, did it serve in this capacity that finally it was decided to turn the boat into a regular and permanent bungalow of concrete.

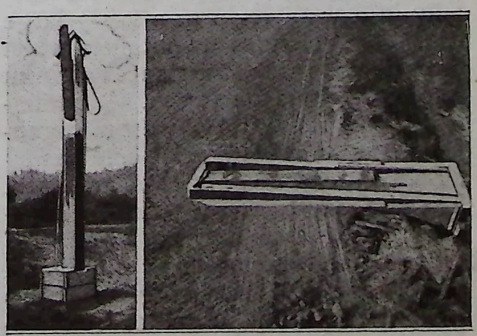
Above, the Bow and Port Side of the Houseboat Residence are Shown. A Second Story has been Added, the Fore Deck Walled and Glazed, a Small Porch and Entrance Provided Amidships, and the Exterior Finished with Concrete. At the Left Is a Stern View, Showing the Original Paddle-Wheel Boxes Still in Place

In making this transformation, no change was required in the construction of the craft proper, and as the roof was perfectly flat the addition of a second story was easy enough. The changes made on the first floor were comparatively simple. First, the guest room was turned into a hall stairway leading to the second floor, and the window of this room was changed into a door, which now serves as the main entrance to the dwelling. A double doorway was cut in the wall separating the owner's bedroom from the living room, the bedroom now being used as a dining room. The forward deck of the boat was then inclosed to make a sun parlor, and finally a part of the rear deck was cut through to permit excavating for a small cellar.

As this artistic bungalow stands today it still retains all the outlines of the original houseboat, even to the paddle-wheel boxes at the rear and the curves of the prow and stern.

MOUNTAIN-HIGHWAY SIGNAL WORKS AUTOMATICALLY

A mechanical signal system has been installed on a mountain road in the West which automatically warns persons beyond a bend in the highway, when a vehicle approaches. The signal consists of a red semaphore arm pivoted to a post so placed that it can be seen some distance from the bend, while 165 ft. from it, in the opposite direction, is a releasing lever imbedded in the highway and connected with the

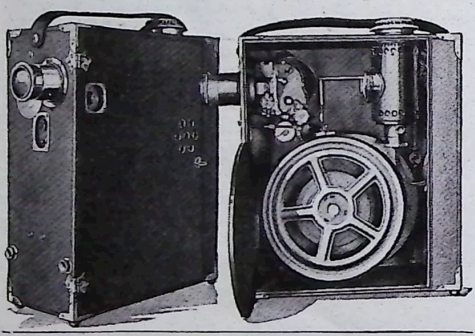


Left: The Signal Arm is Made to Spin When an Automobile Passes Over a Releasing Device in the Road. Right: The Releasing Mechanism

signal by a wire. When an approaching automobile passes over this lever it releases the signal arm causing it to spin rapidly. Vehicles moving in the opposite direction do not operate the device.

MOVING-PICTURE PROJECTOR FOR SALESMEN AND OTHERS

Lightness and compactness, prerequisites of a satisfactory portable movie projector, are accentuated qualities of



The Machine Weighs Only 19 Pounds and is Built in a Substantial Housing That Serves as a Carrying Case. Right: Interior View of the Portable Projector, Showing Compact and Convenient Arrangement of Its Parts

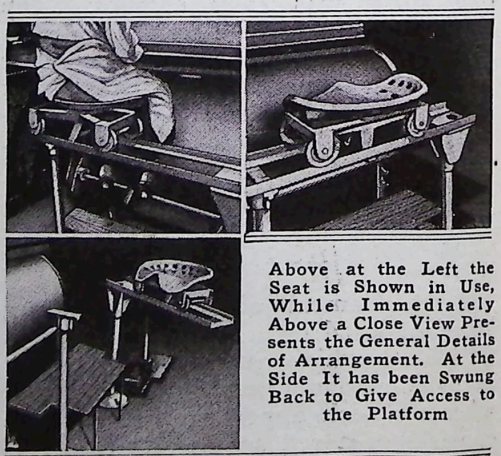
a new machine of current introduction. The housing, which is covered with artificial leather and serves as a carrying case, measures 7 by 16 by 18 in. The complete unit weighs only 19 lb. Standard film is accommodated, and the magazine has 1,000-ft. capacity. Electric energy, either direct or alternating, may be taken from any lighting socket. Unlike some portable projectors, this one may be used successfully in a small room or a fairly large hall. Sharp pictures are obtained when projection is made at distances of from 6 to 60 ft. from the screen. Illumination is supplied by a 250-watt nitrogen-filled lamp. Three special condensing lenses, instead of only two, are used. The film may be run forward or backward, or held stationary to give a "still" picture. Rewinding is accomplished quickly without removing the reels from the machine. All that is necessary is to slip the film out of the gate, press a small lever, and begin cranking.

ALCOHOL NOW OBTAINED FROM SOTOL

A yuccalike plant, called sotol, which grows in abundance in northern Mexico and also in parts of western Texas, promises to be a source from which much alcohol can be obtained. One concern is already engaged in manufacturing alcohol from this plant and soon expects to have a daily output of 250 gal. It is said that sotol can be gathered at a cost of from $2 to $5 per ton, and that from one ton 18 to 25 gal. of alcohol can be obtained.

FACTORY SEAT FOR MAIMED OPERATES ON TRACK

For crippled machine and bench workers in factories and shops, a new type of chair has been developed which appears to have much merit. It consists of a seat, such as is provided with farm implements, that is mounted on a light four-wheel truck. The latter operates on a narrow track. The purpose of the arrangement is to enable men who have lost one or both of their legs to move to the right or left with ease when working at a loom, lathe, bench, or table. The seat is readily actuated by exerting slight pressure against an



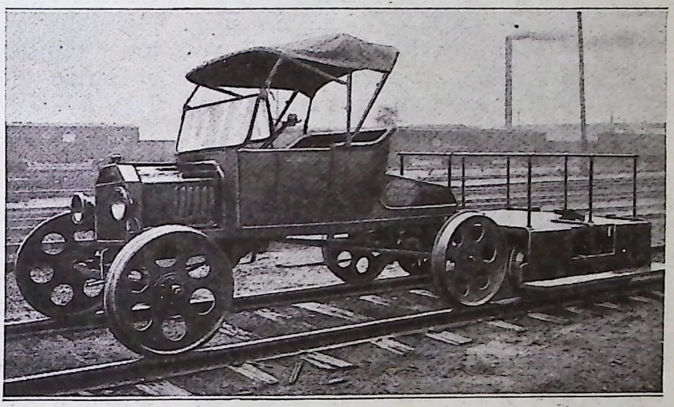
Above at the Left the Seat is Shown in Use, While Immediately Above a Close View Presents the General Details of Arrangement. At the Side It has been Swung Back to Give Access to the Platform

COURTESY OF FRANK B. GILBREATH

adjustable foot rest, or by pulling or pushing with the hands. The track is pivoted so that it may be swung out of the way when desired.

EQUIP AUTO AND TRAILER TO HAUL MEN BY RAIL

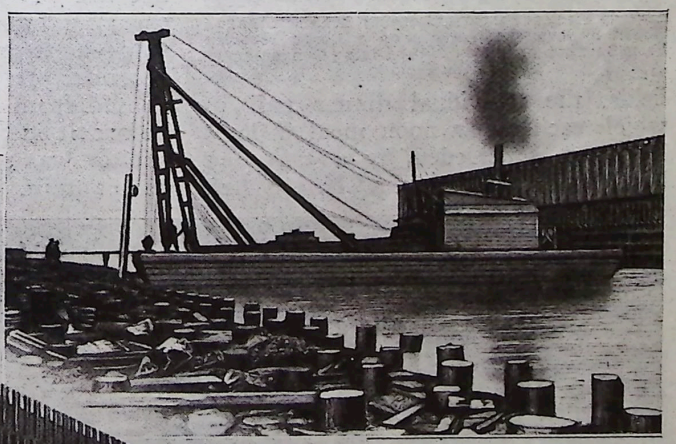
A low-priced automobile has been equipped with light flanged wheels so that it can travel on a railroad track and draw a trailer on which a crew of Michigan Central employes go to and from their work. The time saved by the outfit makes it a profitable investment for the railway. No steering wheel is required for the car. Side steps and a railing on the trailer give it a capacity of about 20 men and their tools. The steering post of the automobile appears novel indeed, the wheel having been removed, leaving only the controlling levers attached to it. A top shelters the seat. The cost of operating this car is surprisingly low, considering the number of men carried.



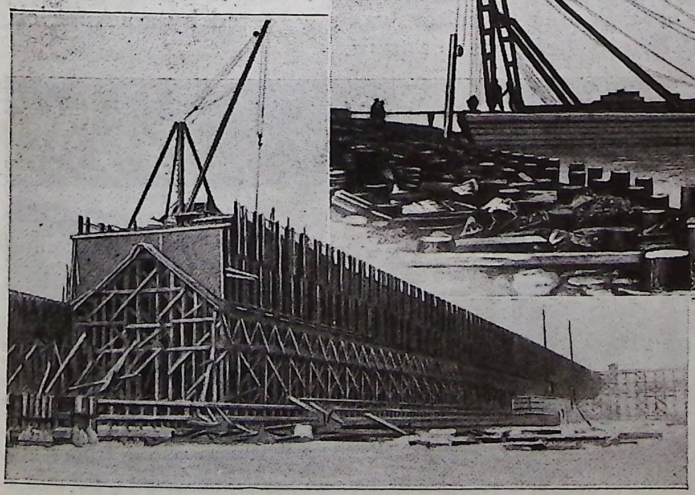
Low-Priced Automobile, Equipped with Flanged Wheels, Drawing a Trailer on Which 20 Workmen are Taken to and from Work

DEMOLISH HUGE DOCKS WITH DERRICK AND SCOW

The removal of two mammoth ore docks at Two Harbors, Minn., was the big wrecking task undertaken not long since, to make room for a new steel-and-concrete dock. One was 1,054 ft. long, 66 ft. high, and contained 170 pockets. The superstructures were demolished with the aid of a traveling derrick, having a 60-ft. boom, which moved on a track laid on top of the dock. The



Scow Equipped with an A-Frame and Powerful Tackle, Pulling Piles Which Supported a Dock

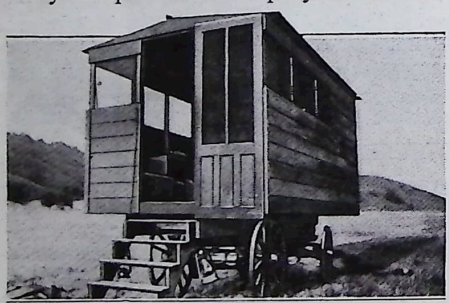


Beginning the Wrecking of One of the Huge Ore Docks: The Derrick Shown Travels on a Track, Enabling It to Work Rapidly

complete removal of one pier foundation was an even greater task, for some of the long white and Norway-pine piles penetrated the stiff clay more than 20 ft. and offered tremendous resistance. To extract them, a scow equipped with a steel A-frame and two sets of five-sheave blocks, that could exert a pull of 110 tons, was employed. If all of the piles removed had been placed end to end they would have extended 20 miles. The foundation cribs and filling had to be dredged out also.

TRAVELING LUNCH ROOM FOR FARM HANDS

On a large western farm where many helpers are employed in the



A Novel Piece of Farm Equipment: A Lunch Wagon Which Follows the Workers on a Large Western Farm So That They may Have Dining Conveniences in the Field

fields, the individual dinner pail in which each man's noon meal is kept has been superseded by a traveling lunch room in charge of a Chinese chef. It is a light frame structure, with a screened door and windows, mounted on an old running gear and drawn by one horse. Within are rough furniture for the diners and kitchen equipment, including a small stove and refrigerator. Hinged steps give access to the entrance at the rear.

WIPE OUT CHARITY DEBTS WITH BONDS, NOT CASH

The Woman's National Liberty Loan Committee suggests that contributions for defraying the debts of churches and charitable organizations can be made to do double duty by making them in the form of Liberty-loan bonds instead of cash. Such contributions can be placed to the credit of the society in question and the interest used in defraying the interest on the mortgage.

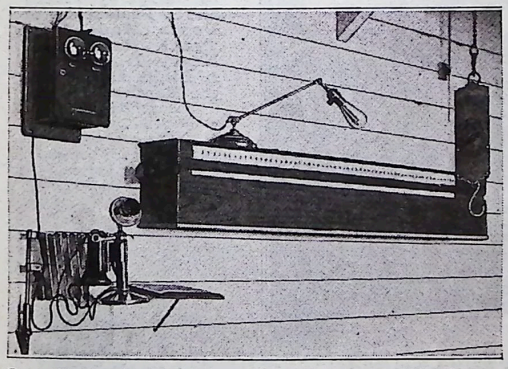
CANVAS SHADES BANANAS ON CONVEYOR BELT

Some idea of the penetrating power of the tropical sun is suggested by the fact that a canvas shelter is thought necessary over an endless conveyor carrying bananas from box cars to a ship—a transfer occupying but five seconds. In this way the fruit is prevented from being unduly heated just before it is packed in the hold. The shelter was suggested by an American sea captain.

Scene in a Colombia Port Showing Natives Carrying Bananas from Box Cars to a Conveyor, above Which Is a Canvas Covering to Keep the Fruit from being Exposed to the Sun on Its Five-Second Trip to the Vessel

HANDY CASE FOR KEEPING RECORD OF DAIRY HERD

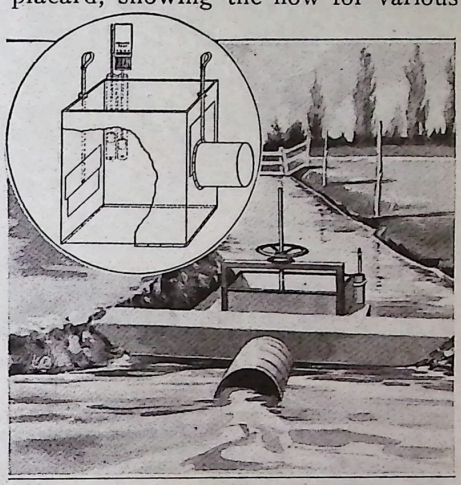
An inventive dairyman has installed on his farm a record holder, which saves much time in keeping accurate account of the milk yield of 70 cows. A record sheet, good for 31 days, is mounted on a 6-in. roller, 56 in. long, and inclosed in a case hung in a convenient place in the dairy. Each milking is weighed on near-by scales and entered on the sheet, a portion of which is accessible through a slot in the front of the case. The roller is turned from day to day as occasion requires. The cows' names, and their numbers, running from 1 to 70, are posted immediately above the slot to indicate where each animal's entries should be made. At the end of the month the entire herd's record is in tabulated form.



On a Roller in This Case Is a Sheet, on Which are Entered the Milk Records for 70 Dairy Cows. The Weighing of the Milk is Done on the Scales Shown

SIMPLE IRRIGATION METER AND GATE COMBINED

Simplicity and accuracy have been sought in designing a submerged orifice for measuring water delivered from irrigation canals. It consists of a galvanized-iron tank having an adjustable intake and a discharge opening, while mounted on the outside are two floats inclosed in vertical cylinders. One of these is open at its lower end, and the float within rises and falls with the level of the canal. The other cylinder is inclosed at its lower end, but is connected by a pipe with the interior of the tank. A table of figures on a placard, showing the flow for various heads, rises and falls with the second float, moving inside an envelope similarly controlled by the other float. In the side of the envelope is a slot through which appear the proper readings to indicate the flow for the existing head.



Equipment for Use on Irrigation Canals That Combines the Function of a Gate and a Meter: The Gauge, Controlled by Two Floats, Indicates the Rate of Flow through an Orifice of Any Desired Size and with Any Head of Water

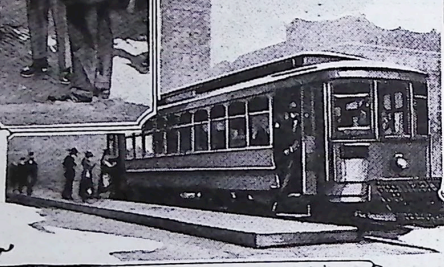
NOVEL TARGET IS EMPLOYED BY AERIAL GUNNERS

In practicing aerial gunnery, cadets at one of the flying schools direct streams of bullets at an unusual ground target while maneuvering in the upper atmosphere. It is a water target of the shape and general size of an aeroplane, and is built within a limestone circle at a point of safety in an open prairie. The splashing of the water indicates to the gunner that he is hitting the mark. For this and other reasons the arrangement has proved good.

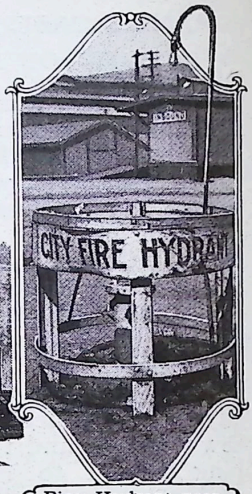
If a Gunner is Hitting the Target, the Splashing of the Water Indicates the Fact to Him

CIVIC FEATURES THAT PROMOTE THE COMFORT

First Aid in Los Angeles Parks: Thoughtful Officials have Placed Emergency Outfits in Each Park, Posted Signs Telling Where They Are, and Taught Employes Their Use



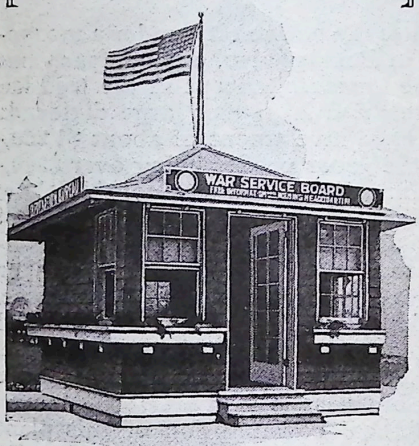
One of the Low Platforms at the Stopping Places of Washington's Street Cars, That Serve as "Isles of Safety" and Are a Great Convenience in Getting on and off the Cars



Fire Hydrant near a Freight Depot in Los Angeles, Exposed to Bumps by Trucks and So Protected with Posts Made from Track Rails, and Heavy Iron Bands: A Light Illuminates the Barrier and Sign at Night

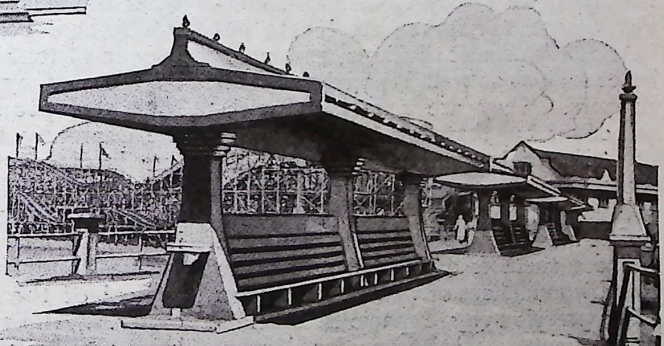
Big Logs, Too Heavy to be Rolled by Mischievous Youngsters, Inclose This Children's Sand Pile in a Park. The Short Sections, Set on End, Serve as Convenient Seats

The Handsome Rustic Lodge in Genesee Mountain Park, Built and Controlled by the City of Denver, Where the Public can Obtain Ample Accommodations at Reasonable Prices: The Lodge is Named after Hosa, a Noble Indian Famed in the History of the Region

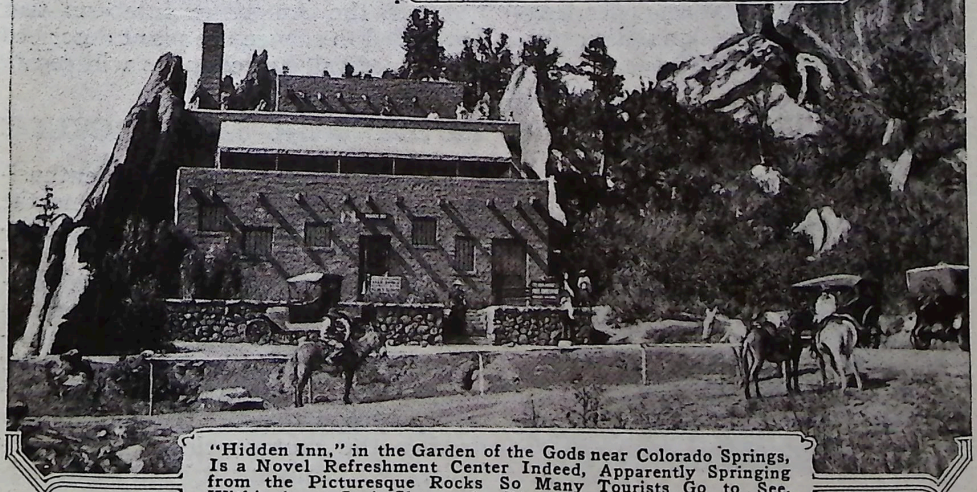


Attractive Headquarters of the San Antonio, Texas, War Service Board in the Down-Town District: Here Visitors can Always Obtain Information about the City, the Near-By Army Camps, Boarding Accommodations, and the Like

The Consolidated Ticket Offices in the National Capital: A Benefit Particularly to Travelers Unfamiliar with the City, Which will Also Effect a Big Saving in Office Rental



Three of Nine Well-Built Ornamental Shelters on the Breeze-Swept Municipal Pier at Redondo Beach, California: Each Shelter Has Two Seats Set Back to Back. At the End Is a Drinking Fountain



"Hidden Inn," in the Garden of the Gods near Colorado Springs, Is a Novel Refreshment Center Indeed, Apparently Springing from the Picturesque Rocks So Many Tourists Go to See. Within Are a Curio Shop and a Dining Room, While on the Roof Are a Dining Balcony and an Observatory

BIG OPENINGS IN CHINA IN ELECTRICAL LINES

By F. H. WILLIAMS

IN all parts of China the development of electric power offers unlimited possibilities to the American engineer. Perhaps conditions can best be understood by special reference to the Province of Chili, where two years ago Peking and Tientsin were the only cities supplied with electricity, in spite of the fact that there is a large demand for it. With American engineering skill and business ability set to work in this field, big things could be accomplished.

Chili has a population of approximately 23,000,000 and, with considerable reason, foreigners are led to believe that this part of China, and many other regions as well, is populated with paupers. They are numerous, without doubt, but there is a larger number of thrifty tradesmen, gentry, and small manufacturers in various stages of prosperity.

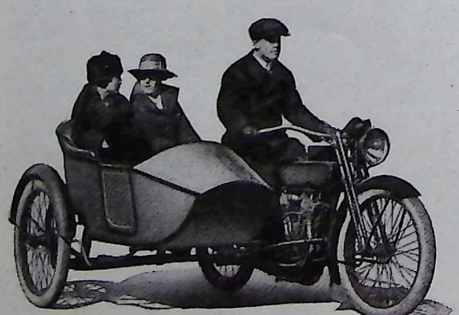
One must understand that among the Chinese there is a decided reluctance to show evidences of wealth. Centuries of oppression by rapacious officials have driven wealth under cover, though well-stocked shops in all towns and cities are evidence of prosperous customers.

In Tientsin there are several small electrical plants operating under franchises from various foreign settlements, and a French-Chinese concern that supplies the native city under a monopoly. In Peking, also, one company has all the business, except in the legation quarter, and is paying large dividends on a total investment of about $1,250,000, the gross profits being over $500,000 annually. And yet consider how utterly inefficient is the operation of this plant. The company makes no effort to get business, but accepts or refuses applications as they come. Purely a lighting load is carried, and the plant is not run in the daytime, so that anyone can see at a glance what business is lost.

The coal consumption of this plant is over 45 tons per day and could easily be reduced by half, but the coal is a source of profit to certain persons in the company and so economy in this line is discouraged. The three directors who run the concern appear to be afraid lest the government exploit them in some way.

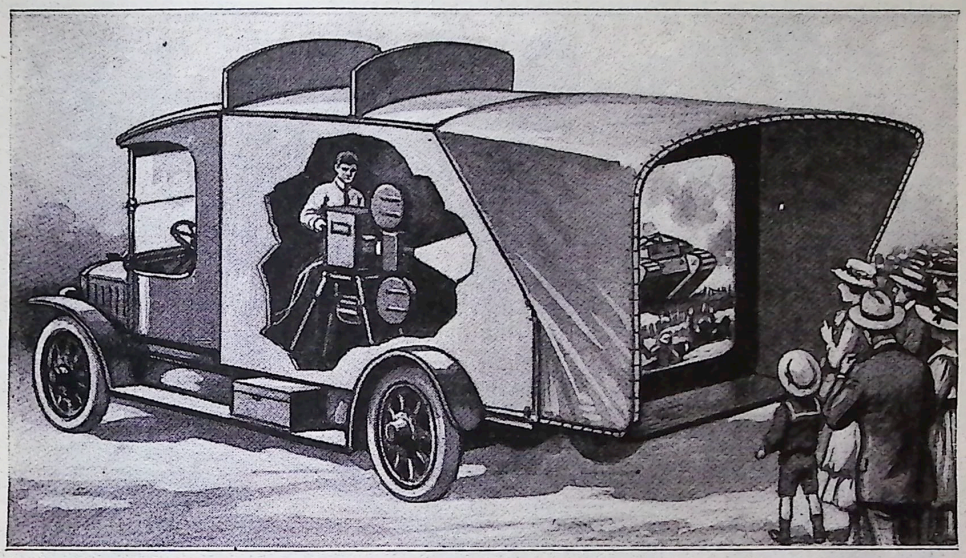
The conditions described are quite typical of the electrical industry generally. Affairs are conducted in a happy-go-lucky fashion, few books are kept, and business seems often subject to official caprice and greed so that concerns are reluctant to manifest prosperity by any additional outlay of capital. If the American interests that have tried to secure the plant described are successful, big changes will result.

TWO-PASSENGER SIDECAR BUILT FOR MOTORCYCLE



The Two-Passenger Sidecar Makes a Small-Family Vehicle of the Economically Operated Motorcycle

There are many motorcycle enthusiasts who doubtless will welcome the announcement of a two-passenger sidecar. Such an attachment has lately been introduced. It enables the combination to accommodate three persons comfortably. The sidecar seat measures 30 in. in width, which is quite adequate space for two persons of ordinary proportions. In addition to making the motorcycle a family vehicle, the arrangement has distinct advantages for the salesman who is demonstrating a machine.



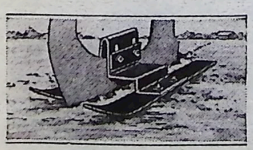
A British Traveling Outfit Equipped to Give Motion-Picture Shows, Day or Night: That the Pictures may be Viewed from the Side of the Screen Opposite to the Projector, Semiopaque Fabric is Used

MOVIE TRUCK GIVES SHOWS OUTDOORS IN DAYLIGHT

A portable movie outfit with which outdoor exhibitions can be given in the daytime as well as at night has been patented in Great Britain. The projecting machine is mounted in a motor van and throws pictures on a screen stretched across the rear end of the car body. In order that the pictures may be seen by those assembled in the rear, a hood is provided at the rear which partly shades the screen.

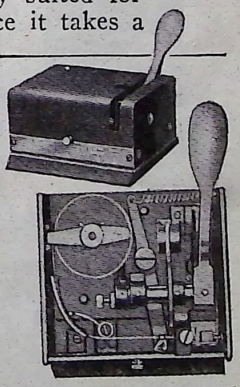
GAUGE MAKES PLANTING OF CORN UNIFORM

Too deep planting of corn, which is the cause of much seed failing to come up, may be prevented by means of a gauge that can be easily attached to the furrow opener. It consists of two metal runners which are set either side of the vertical blade and prevent the latter from making a furrow of more than a certain depth. The attachment can be adjusted as desired.



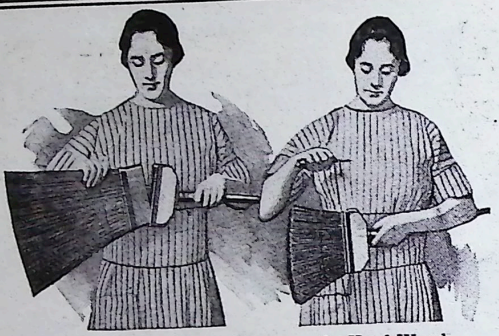
WIRE STAPLER OPERATED AT VERY LOW COST

A minimum of care and expense is required to operate a new stapling machine, especially suited for office needs. Since it takes a spool of 1,250 ft. of wire, costing a small sum and sufficient for 15,000 staples, it needs reloading very infrequently. The mechanism is contained in a metal case, measuring 6½ by 6¼ in., and in its side is a slot where the sheets to be bound are inserted. Each downward movement of a projecting lever handle makes and clinches a wire staple. From 2 to 40 sheets can be bound at one time.

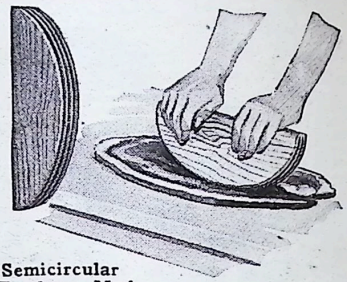


¶The Liberty-loan committee in a New England town obtained permission to sound the fire alarm and by that means quickly gathered big crowds for outdoor rallies.

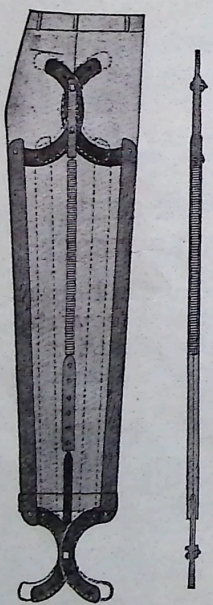
SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



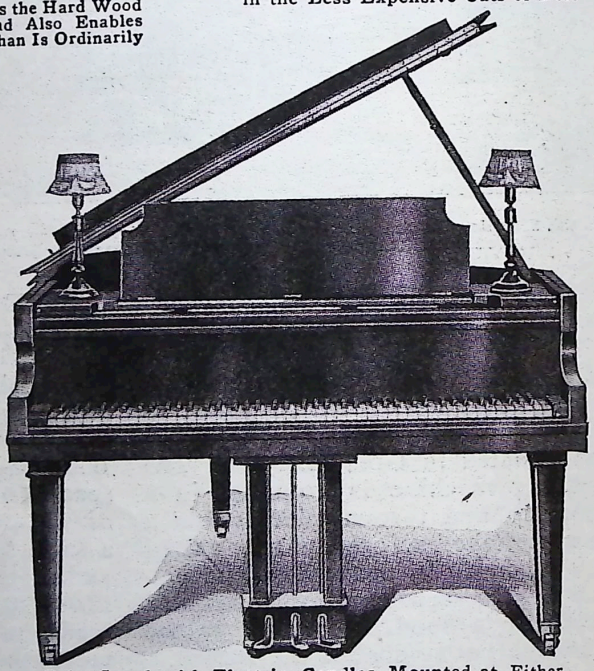
This War-Time Broom Conserves the Hard Wood Used in Making Handles, and Also Enables Shorter Straw to be Employed than Is Ordinarily Possible



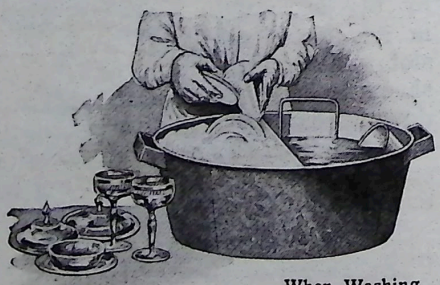
Semicircular Tenderer Made of Wood and Intended for Use in Breaking the Fibers in the Less Expensive Cuts of Meat



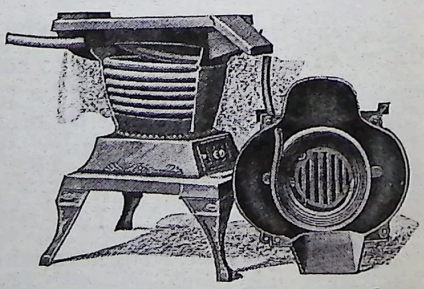
Mechanical Trousers Press That is Readily Adjusted to Different Sizes: The Side Members Have Sharp Edges Like Rulers



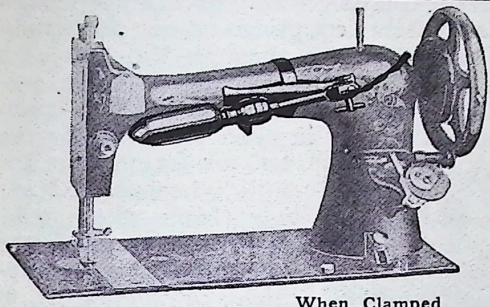
Baby Grand with Electric Candles Mounted at Either Side and Wired Invisibly: The Instrument is Also Equipped with a Special Mute That Prevents Children from Disturbing Neighbors by Loud Playing



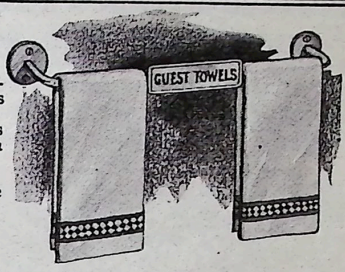
When Washing Fine Glassware This Two-Compartment Dishpan Is Convenient, for It Facilitates Rinsing. Price $3.50



A Spiral Coil of Half-Inch Pipe Forms the Fire Bowl of This Water Heater, Which in Outward Appearance Resembles an Old-Fashioned "Monkey" Stove

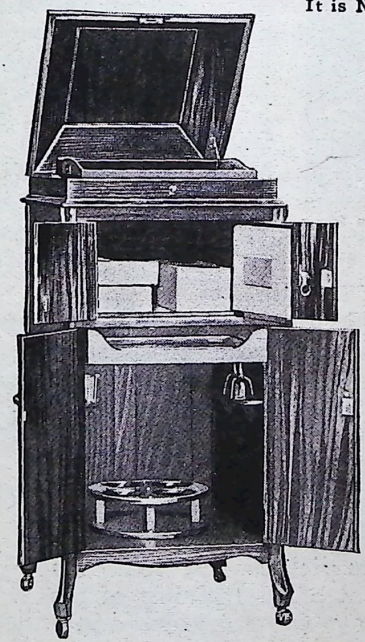


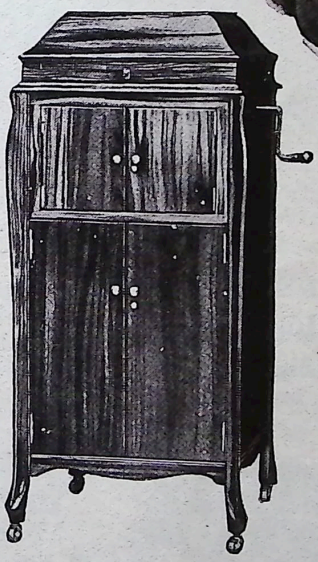
When Clamped to a Machine as Shown, the Sewing Lamp Is Not in the Way and Casts Light Where It is Needed



This Small Plate, Bearing the Words "Guest Towels," is Equipped with Clips That Grip Rod Firmly. Price 50 Cents

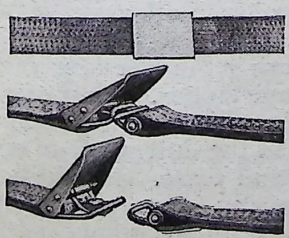
Pillow of Special Shape with Pocket That Permits Filling to be Lessened, Increased, or Loosened, as Suits User



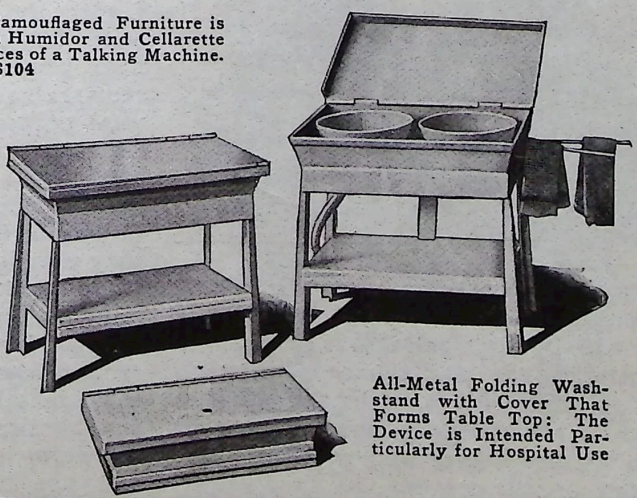


An Amusing Example of Camouflaged Furniture is Introduced in the Form of a Humidor and Cellarette That Has All the Appearances of a Talking Machine. Price $104

Child's Folding Toilet Seat That Fits on Regular One: It is Finished in White Enamel



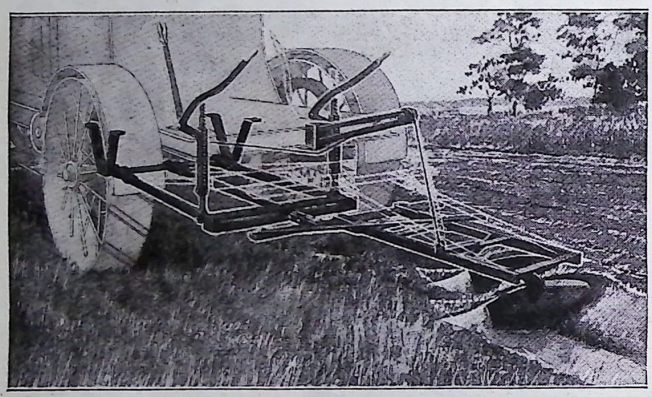
Quick-Releasing Belt Buckle Especially Designed for Airmen but Equally Serviceable for Many Others



All-Metal Folding Washstand with Cover That Forms Table Top: The Device is Intended Particularly for Hospital Use

NEW ADJUSTABLE DRAWBAR PREVENTS POWER WASTE

Special merit is claimed for a new drawbar recently put into use because of the fact that, being adjustable, it serves equally well in making a high or a low coupling, thus preventing loss of power through the lack of a straight pull. It consists of a rectangular steel frame hinged to a cross-beam which in turn is bolted to the tractor frame near the bull wheels. Extending from the cross-beam to the rear is the bar to which the vehicle, or implement, to be drawn is connected. Various sets of bolt holes permit this bar to be shifted to the right or left. By means of levers the rear of the frame and bar can be set high or low, according to the needs of the load, whether it be a plow or a wagon.



Phantom View Showing a Drawbar of New Design Connecting a Plow with a Tractor: Being Adjustable, It Serves Equally Well for a High or Low Coupling, Affording a Straight Pull for Either a Plow or a Wagon

CALKING MACHINE AN AID TO SHIPBUILDERS

To the rapidly growing number of labor-saving inventions brought out by the present activity in shipbuilding, may now be added a pneumatic calking machine which will do the work of 10 men. In shape and size it resembles a bicycle pump and can be adjusted to suit various needs, so that it promises to be a particularly important device in the building of wooden ships. One man, usually accompanied by a helper, operates it, and the oakum used is spun especially for the machine. It is claimed the cost of calking is reduced to one-eighth or one-tenth the former cost.

A New Compressed-Air Tool That Calks Seams in Wooden Ships About as Fast as 10 Men can Do the Work by Hand

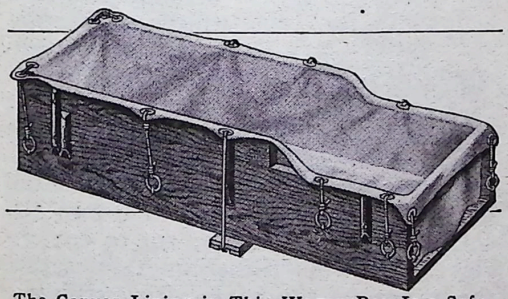
MOVIES USED IN INTENSIVE TRAINING OF FIGHTERS

Motion pictures are being employed in the intensive training of troops at our army cantonments and camps. Under the direction of the general staff, 32 different military subjects have been painstakingly treated in a remarkable series of 57 reels. Two vital purposes are served by the pictures, which embrace all arms of the service and portray important developments made during the last four years in armament and tactics. First of all, they visualize in an interesting manner what is buried in the dull pages of military manuals and texts. In addition, they explain to men in one arm of the service what is being accomplished by those in other arms. The mechanical construction and the operation of the Browning machine gun, the character and use of the new French "one-

pounder" for operations against "pill-box" defenses and tanks, bayonet dueling, trench designing and construction, gas attacks, grenade construction and use, and various other subjects of similar nature are treated in a comprehensive manner. The pictures give the men broader ideas of the soldier's range of duties than would be possible for them to acquire otherwise in the brief time available for instruction.

PATENTED CANVAS LINING FOR WAGON BOXES

A wagon box can be made leak-proof for grain, sand, or other loads of similar nature, by means of a patented canvas lining which is held in place with ropes and eyelets caught over suitable hooks on the outside of the box. One end of the lining has a cut-away portion that can be used as an

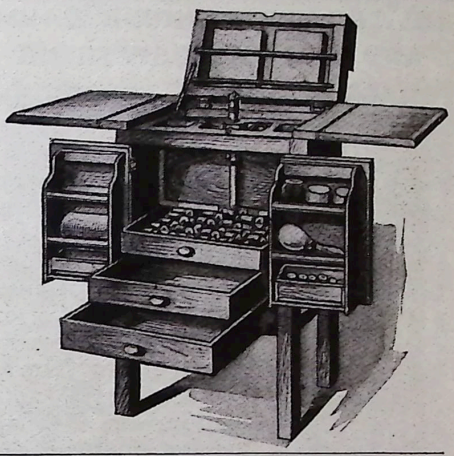


The Canvas Lining in This Wagon Box Is a Safeguard against Loss of Any Part of the Load through Leakage

extension of the bottom and stretched to an adjoining bin into which a load is being shoveled. A flap and a gusset are provided at this end to close the opening completely, when desired.

NEW SEWING CABINET HAS MANY CONVENIENCES

Many of the needleworker's wants are supplied in a sewing cabinet, recently patented. On the inside of the two front doors are racks for materials. Lower than the doors is a large drawer having a front and a rear compartment, while above this drawer are two smaller ones and a compartment for a work basket. The top is made in two sections that fold together and, when opened, stands on edge. On its underside are racks for holding patterns,



A Sewing Cabinet with Large Compartments, Pockets, and Drawers, So Arranged That a Needleworker's Materials Are All Easily Accessible

while immediately below the top is a tray for needles and buttons.

LIQUID AIR USED TO FILL NEW LIFE BELT AT WILL

A life belt which can be worn deflated until an emergency arises, and so is inconspicuous, can be filled with air in an instant by means of a cartridge attached to it, containing liquid air. The air is released into the soft-rubber article by lifting the cartridge to a posi-

Merely by Raising the Cartridge Hanging at the Side of This Life Belt, Liquid Air is Released from It and will Instantly Inflate the Belt

tion at right angles to the body and pressing on it. Inflated in this man-

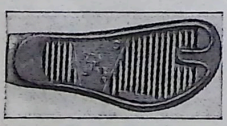
ner, the belt will support 500 lb. in water, it is claimed, though the article itself weighs but 11 ounces.

HEATER KEEPS ENGINE WARM AND AIDS QUICK STARTING

If one wishes to keep the engine warm overnight so as to facilitate quick starting on cold mornings, an electric under-hood heater, equipped with a handle at one end and a swivel hook at the other, is a handy accessory for the car. It may be connected with an ordinary lighting socket and hooked next to the radiator, engine, or carburetor. The grip enables it to be handled readily when hot.

ROUGH-RUBBER SOLES WORN MUCH BY JAPANESE

That the making of footwear for Orientals in many cases has been reduced to its simplest terms is shown in the type of rough-rubber sole for which there is a great demand in Japan. It is sold with a narrow edge left, onto which the buyer sews a cloth upper. This shoe is worn much by the jinrikisha men who run mainly on their toes. The toe and heel of this sole are made extra-thick, and a special division for the great toe is provided.



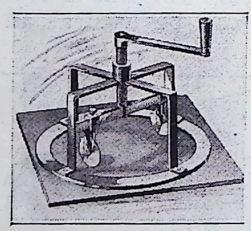
COURTESY INDIA RUBBER WORLD

EQUIP NURSES IN FIELD LIKE OFFICERS

For the first time in the history of the Army Nurse Corps of the United States, women are to be sent into the field with the same equipment as the officers. They will be assigned to travel with the mobile hospital units, the purpose of the latter being to insure a minimum loss of life by carrying the operating room to the injured man rather than transport him long distances. Frequently these units will be established within five miles of the front-line trench. Each nurse will carry the typical outfit of an officer, complete from the field kit of aluminum utensils to a canvas bed roll. The women will live under the same conditions as the men, housed in tents and eating at a mess furnished from a field kitchen.

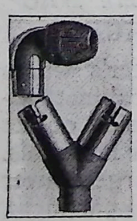
IMPLEMENT CUTS GASKETS OF ANY SIZE

A serviceable implement has been patented which can be adjusted to cut gaskets of various sizes. On a base having a circular opening is a frame supporting a vertical threaded shaft. Attached to the lower end of the latter is a graduated horizontal bar, or sweep, equipped with two circular knives that can be set to cut circles of any desired diameters within the range of the tool. By turning a crank, the knives cut the gaskets from material placed beneath them.



Y-SHAPED PLUG SOCKET FOR AUTO DASHBOARD

By using a new Y-shaped plug socket one outlet in the dash of an automobile can be utilized for two connections such as a dash lamp and a trouble lamp, cigar lighter, or spot light. An angle-shaped plug is also provided that may be used in connecting the flexible cord of a trouble lamp, or the like, to the dual-armed fixture.

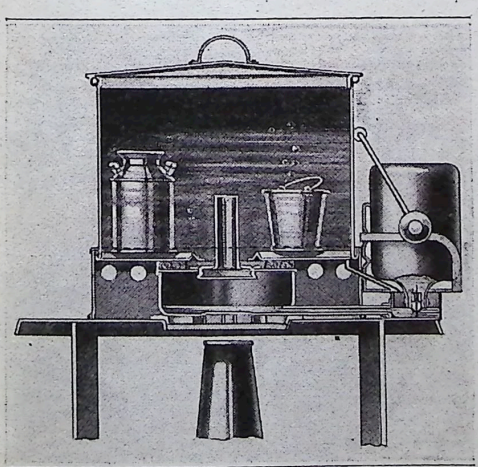


AID BEES BY USING COMBS REPEATEDLY, SAY EXPERTS

Beekeepers everywhere are being urged by experts of the Department of Agriculture to produce more extracted, or strained, honey, instead of comb honey, in order that the bees may gather a maximum amount of this much-needed sweetening. The energy required in making 20 lb. of honey is consumed in making 1 lb. of beeswax. If, by extracting honey by a centrifugal process, a comb can be used again and again, naturally the bees will be able to gather far more than if they must each time build up a comb.

STERILIZER FOR DAIRY EASILY OPERATED

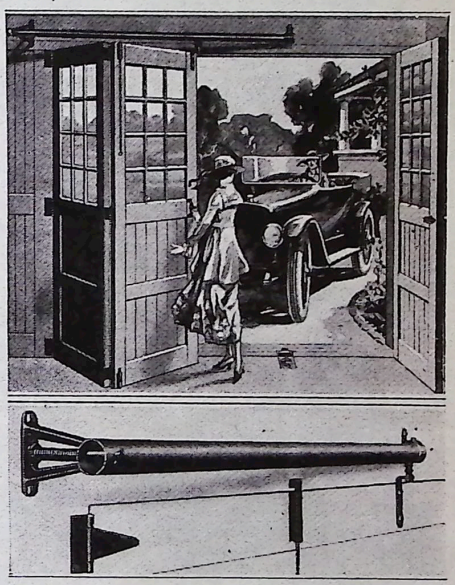
A new, easily operated sterilizer for cleaning milk cans, etc., is provided with a kettle, or boiler, having a vertical outlet for steam, set beneath a large hood in which the articles to be sterilized are placed. Water is supplied to the kettle by an automatic vacuum system, a pipe connecting it with an inverted reservoir from which water flows only when the water level in the kettle falls below a certain point. Because of the small amount of water in the kettle steam generates rapidly.



Steam is Generated Quickly in the Kettle beneath the Hood of This Sterilizer Because an Automatic Supply System Keeps the Water at a Low Level

FOLDING GARAGE DOOR HAS CONVENIENT FEATURES

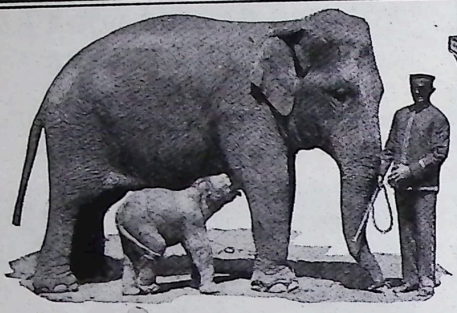
A garage door of improved design is composed of three units, one of which, hung at one side, can be opened and closed independently, serving as a separate entrance. The other two units are hinged together, the center one being suspended from a hanger which travels in a cylindrical casing, a slot being provided in the lower side for the connecting arm. The bracket supporting the end of the track, just above the side of the doorway, is provided with a spring-held pinion that passes through the track, giving the latter a certain amount of lateral play under pressure. This feature holds the doors securely against the wall, when folded.



Three-Unit Garage Door: The Right-Hand Unit can be Opened and Closed as a Separate Entrance. The Hanger Makes the Folding Parts Easy to Operate. Below: The Cylindrical Hanger Track, the Near End of Which Has a Certain Amount of Play, being Supported by a Spring-Held Pinion

¶A contract has recently been awarded for a freight and supply terminal for the War Department that will cost approximately $40,000,000 and will contain 6,000,000 sq. ft. of floor space, making it one of the largest structures of its kind in the world.

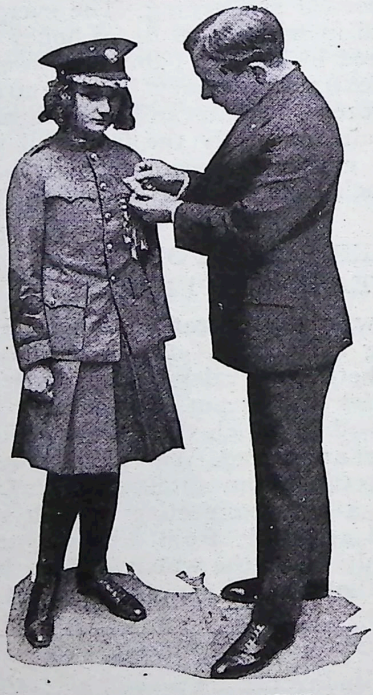
SCENES AND DEVICES OF INTEREST TO CHILDREN



A Husky Baby at Lunch: "Prince Utah" and His Mother Belong to the School Children of Salt Lake City. Despite Flattering Offers by Showmen, These Favorites are Not to be Sold

Manual Training That Entertains: Board Stamped with a Design of a Dismembered Pig, to be Cut Out with Scroll Saw and Assembled

A Musical Hoop That will Delight a Child's Heart: The Sleigh Bells Jingle Merrily as It Rolls Along. In the Center Is an Advertisement



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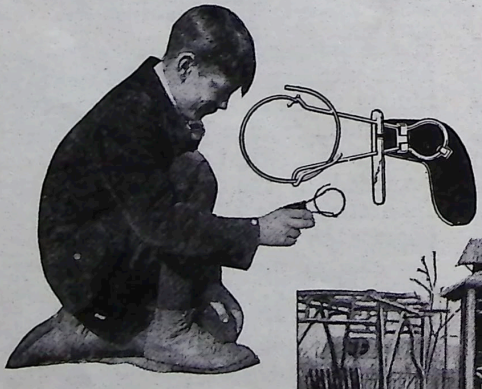
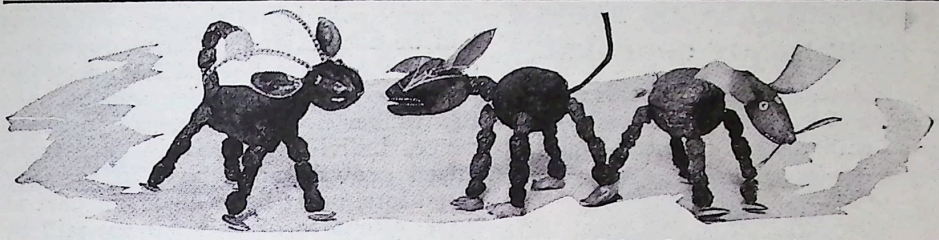
Champion Bond Seller Receiving a Medal: This Is Pauline Henkel, a Schoolgirl Who Sold $304,250 Worth of Liberty Bonds in the Recent Drive

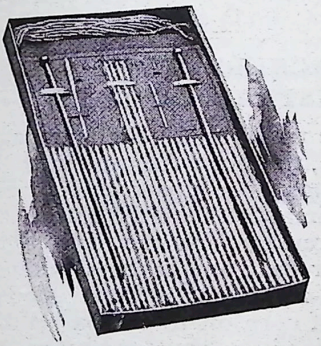


This Harmless Gun Shoots a Wire Ring, Which, on Falling, Rolls Back to the Marksman. It Makes Fun for Grown-Ups as Well as Children

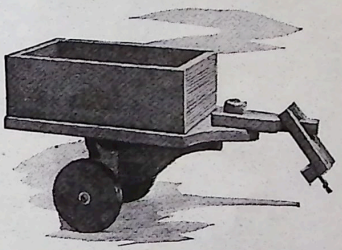
The Yard of a Chicago Bachelor Who Loves Children: In Front of His Rustic Home Is Varied Playground Equipment Which All Little Folks Are Welcome to Enjoy



A Bit of Fun, and a Bite, for Our Soldiers: Nut-and-Raisin Creatures, Unlike Any on Land or Sea, Put in Goody Boxes to Make the Sammies Smile

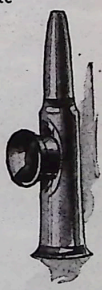


Needles, Yarn, a Crochet Hook, and a Book of Instructions are Provided in This Convenient Set for Youthful Knitters

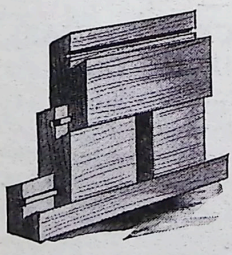


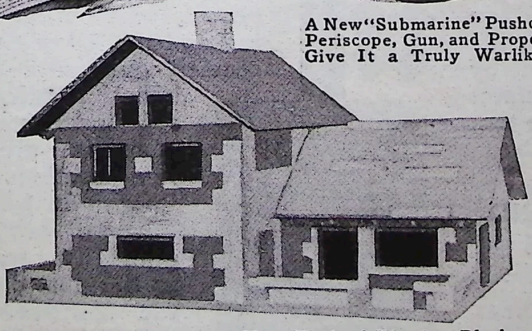
A Trailer Which a Youngster can Hook to His Pushcart for Hauling Sand or a Playmate

A New "Submarine" Pushcart with a Periscope, Gun, and Propeller That Give It a Truly Warlike Aspect

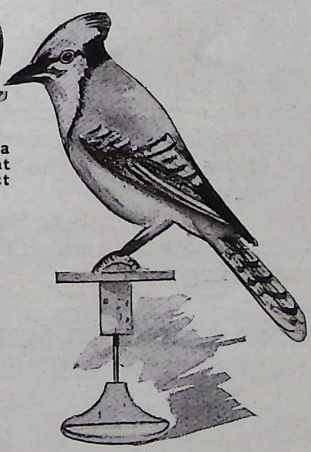


A Bullet-Shaped Music Maker on Which Anyone can Play a Tune: The Sanitary Mouthpiece Is Removable





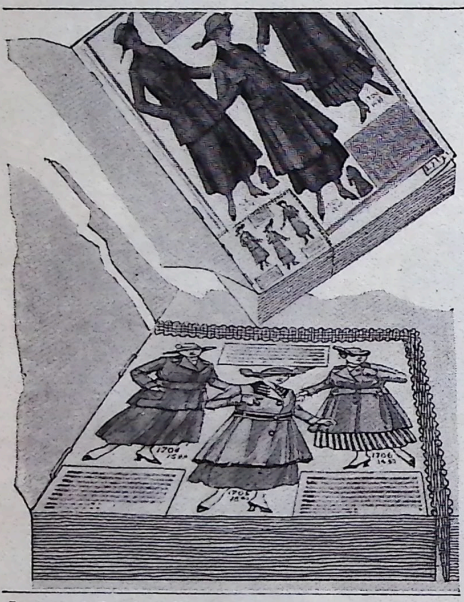
A House Made from a New Kind of Wooden Blocks: Above Are a Few Units, Showing How They are Locked Together by Thin Strips That Slide in Grooves



An Ornament, in Natural Colors, for a Flower Bed or Porch, with Claws That Grasp the Perch and a Bill in Which a Worm can be Placed

SHOPPING-CATALOG PAGES HAVE HANDY COUPONS

Individuals shopping in person or by mail, who have occasion to make purchases with the aid of a catalog, will



Improved Catalog, Each Page Containing a Coupon Showing a Miniature of the Designs Listed, Which can be Removed and Carried by the Shopper for Reference

find a new feature for catalogs a great convenience. In each page is incorporated a small coupon containing miniature reproductions of the designs shown on the rest of the page, together with prices and other data needed in making purchases. These coupons, having perforated edges, can be easily detached and conveniently carried in a shopper's bag or sent by mail. At the same time the usefulness of the catalog from which they are torn is not impaired.

BOY SCOUTS TO HELP FIND BLACK-WALNUT TREES

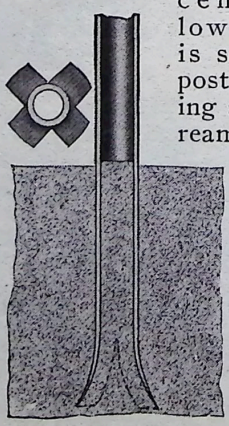
On more than one occasion the Boy Scouts have aided the government, and now the president has called on them again, asking their help in locating the supplies of black-walnut trees in this country. The size of the trees, the price asked, and the owners' names will be ascertained. Large quantities of this wood are needed for aeroplane propellers and gunstocks, and because this timber no longer grows in abundance, individual trees in forests of mixed growth, and those in farmers' wood lots, must be utilized, in part at least. Reports of this survey will be turned in by the scout masters, on prepared blanks, to the Forest Service for the information of the War Department.

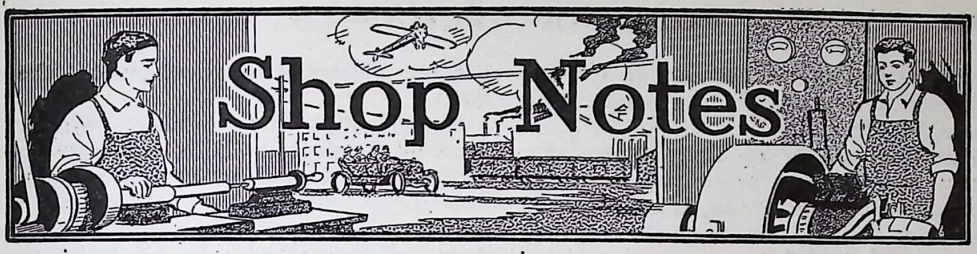
BAKE CRACKERS WITH CORN OIL INSTEAD OF LARD

One of the traditional beliefs among bakers which, the Food Administration points out, has been upset at last, is that only animal fat should be used in shortening crackers, and the like. For nearly a year past one cracker-baking concern has made commercial goods with 13 lb. of corn oil to the barrel of flour, instead of an equal amount of lard, and the flour used was 25 per cent rye and 75 per cent wheat. These goods passed through the hot season unharmed.

HOLLOW FENCE POST HAS SELF-EXPANDING END

Post-hole digging may be done away with by using a hollow metal post, recently patented, the lower end of which is self-expanding. The post is made from piping and the lower end is reamed out on a long bevel forming a thin cutting edge that is divided into sections by longitudinal slits. These sections gradually spread as the post enters the soil, serving to anchor it securely. Suitable means are provided for attaching wires securely to the post.

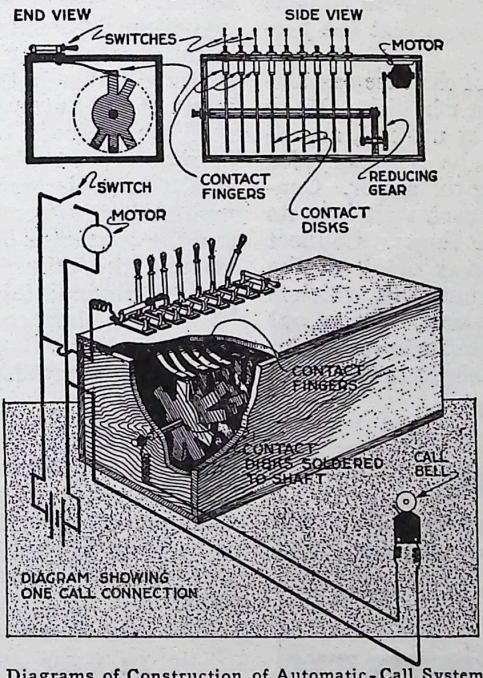




Construction of an Automatic Factory Call System

By K. M. COGGESHALL

PRACTICALLY all large factories and industrial plants are equipped with an automatic-call system because experience has shown that such an outfit is an efficient timesaver. Each foreman and department head is assigned an individual audible signal, or call. When he is wanted at the telephone or in the office, a master mechanism, usually located at the telephone operator's switchboard, is started by the operator. This mechanism rings his call on bells located at various points in the plant. A small shop or factory having but a few departments can, obviously, also advantageously use such a system. The following is a description of an automatic-call equipment which can be constructed at low cost. The details and assembly are indicated in the illustration.



Diagrams of Construction of Automatic-Call System for Factories or Shops: Bells Give Different Calls for the Foremen and Department Heads in All Sections of the Shop

First, decide how many different automatic-call signals are necessary. Then cut a corresponding number of brass disks to a diameter of 5 in. The sheet material from which they are made should, preferably, be at least ⅛ in. thick. Cut away portions of each disk, permitting projecting contactor segments to remain at certain predetermined intervals. For example, if a certain call is "ring, ring, space, ring, ring, ring," then an interval and a repetition of the call, cut the disk as shown in the upper left-hand corner of the sketch. After the requisite number of disks has been prepared, assemble all on a shaft. This shaft should be about ½ in. in diameter and long enough to accommodate all the disks. Preferably it should be of brass. Drill a ½-in. clearance hole at the center of each disk so that it will slip snugly onto the shaft. Solder the disks into position, 1 in. apart center to center, along the shaft.

Then construct of some hard wood a suitable box housing. Mount therein the shaft with the disks placed on it, as shown in the drawing. To produce the signals, the shaft must rotate.

Either a clockwork mechanism or a small electric motor may furnish the driving power. A motor is the

most satisfactory because it can be started and stopped by the operation of a switch and requires practically no attention. Since the shaft rotates at a very low speed, a belt drive, to insure proper speed reduction, is necessary if a motor is used. Cut from sheet spring brass a contact finger, measuring ½ by 8 in. for each disk. Each contact finger is insulated from the others. The wood of the box, to which they are held by screws, provides the insulation. Arrange the contact fingers so that the free end of each touches the corresponding disk segments when they are rotated to a position under the finger. When the disks revolve, the various projecting segments will then contact with the individual fingers at the predetermined intervals.

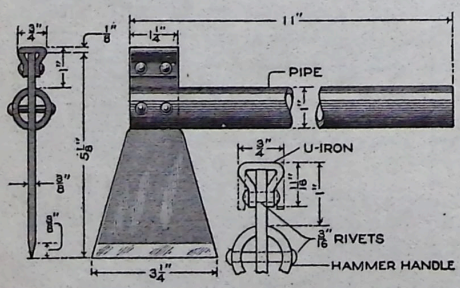
Mount on the top of the case one single-pole switch for each disk. If an electric-motor drive is utilized, an additional switch will be necessary for starting and stopping the motor. Connect one terminal of each switch to its corresponding contact finger. Connect the remaining terminals of all of the switches to the same bus wire, which is carried to a binding post. Bring out to a binding post a lead connecting to the bearing of the shaft, which will provide electrical connection to the disks.

Now install the audible signals. First-class electric bells should be used for the signaling device at each station. If the bells purchased are of the vibrating type, change the connections so that there will be but one stroke of the clapper instead of the usual vibratory ring. Install a sufficient number of signals at different locations so that it will be impossible for a man in the plant to be so far away from all of them that he cannot hear when it signals. In a small shop a storage battery may be used for power for both signaling and for driving the motor. With a storage battery, the signaling bells should be connected in parallel. Connect the bell circuit in series with the battery and the binding posts of the automatic-call mechanism.

If the presence of a certain foreman is required at the office, the switch which controls his signal and which is mounted on the contactor box is closed and the contactor driving mechanism is started, the other switches remaining open. Immediately all of the signal bells in the plant continue to repeat this man's individual call, notifying him that he is wanted.

A Handy Homemade Hatchet

An all-metal hatchet which will withstand all sorts of abuse without adverse effects can be assembled readily from scrap materials. The tool is graphically described in the sketch. A length of pipe serves as a handle. The blade is cut from a piece of 3/16-in. mild-steel plate. The head is bent from a section of ¾ by ¾-in. U-bar. The parts are held together with four 3/16-in. round-head rivets.



A Strong Hatchet, Made of Scrap Material: The Simple Construction is Clearly Shown in the Drawing

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Lock for a High-Power Knife Switch

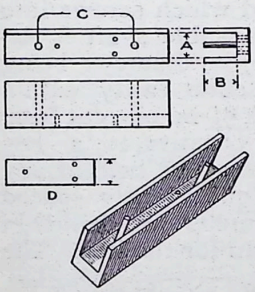
To prevent tampering with the knife switch, by outside meddlers, an eastern company installed a locking device. An ordinary hinged hasp was attached on one side of the switch, being bent in a slight curve to fit over the switch handle and press it down. A staple on the other side of the switch fitted into the hinged hasp, the whole being fastened by a padlock.

An Emergency Spark-Plug Repair

The writer was caught in a rainstorm. Water struck the spark plug of his motorcycle and cracked the porcelain insulation. This short-circuited the plug, as the spark jumped through the crack. Temporary repairs were made by removing the upper broken porcelain, and placing ⅛-in. dry-paper washers in the break. Then the plug was reassembled and fastened in place. The plug worked satisfactorily until home was reached.—Bernard Bergman, Belleville, Ill.

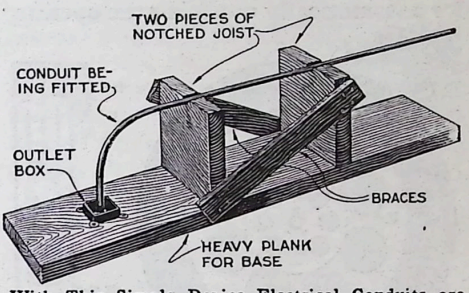
Jig for Drilling Small Sheet-Metal Pieces

Where a large number of small, thin, square or rectangular pieces of sheet metal or brass, having in them one or more holes, are to be drilled, an effective jig can be constructed with little work from a block of steel, as shown in the illustration. In using this jig the pieces to be drilled are piled in the groove of the block. A finished piece, D, which serves as a template to locate the holes accurately, is placed on the top of the others when the contrivance is being used. In width the block should be equal to the dimension A plus ¼ in. Its length should be such that it can, when in use, be held securely and safely by the hand. The slot is milled of such a width that the pieces which are to be drilled can be placed in or taken out of it easily. However, it should not be too wide because this would impair its accuracy. The depth, B, should be such that several pieces can be accommodated and drilled simultaneously. Two guide pins, C, driven in drilled holes, prevent longitudinal motion of the pieces.



Device for Bending Conduit Elbows

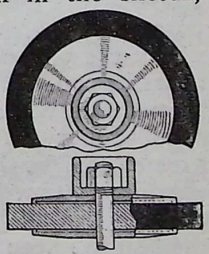
When bending conduit elbows for ceiling outlets, it is often desirable to arrange a form, as illustrated. The heavy end pieces are sections cut from a joist, of the same depth as those used in the building in which the installation is to be made. The plank for the base should be at least 5 ft. long and 2 in. thick. An outlet box of the type being used is mounted on the plank, as shown. After each bend is formed, it is tried in this template as it lies on the floor. The correctness of fit is thus determined without the necessity of taking the conduit to the location in which it is to be installed.—G. G. Hartman, St. Louis, Mo.



With This Simple Device Electrical Conduits are Quickly Bent to Fit in the Location in Which They are to be Installed

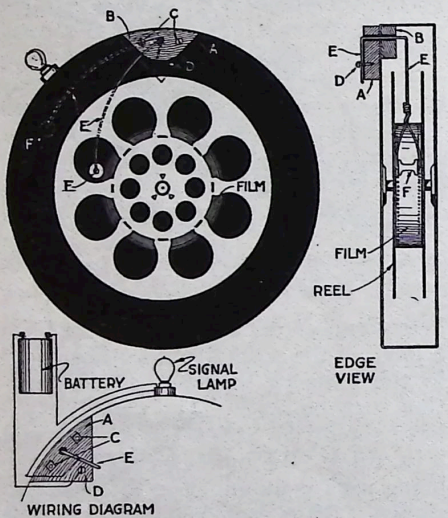
Safety Washer for Fastening Emery Wheels

The safety washer for fastening emery wheels, shown in the sketch, was adopted recently by the safety commission of a great manufacturing state. It is turned from a single piece of steel, which serves as a box into which the nut is set deep enough to avoid all possibility of one's clothing becoming entangled. A socket wrench is, of course, used in the application and removal of wheels with this type of fastening.—Rollin C. Woodford, Meadville, Pa.



Automatic Signaling Device for Projecting Machines

Modern motion-picture projecting machines are provided with mechanism for automatically notifying the operator

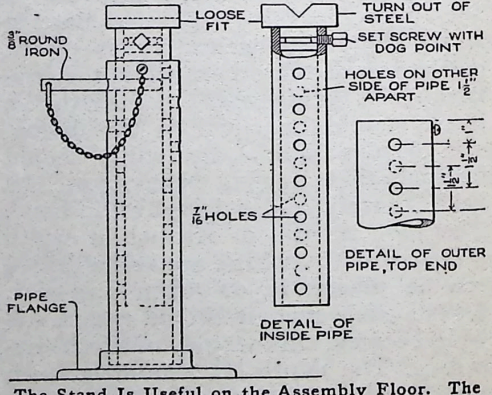


Construction Details of a Simple Electrical Signal for Old-Type Motion-Picture Projecting Machines: By Its Use the Operator is Notified When the End of the Reel is being Approached

when the end of a reel is being approached. The lack of any such mechanism on many old types of machines, still in use, is frequently a source of annoyance to operators, exhibitors, and audience alike. These old-style machines may be modernized in this respect by the installation of the automatic signaling device illustrated. It consists of a simple form of electrical contact by which a globe is lighted to notify the operator whenever the reel nears its end. This is accomplished by means of a contact spring, E, with a small roller on the end F, which presses against the film, descending as the film is unwound, and closing the circuit when all but a small portion of the film has been shown. Referring to the drawing it will be noted that the spring is mounted in the machine upon two wooden blocks, A and B, which are fastened by means of the screws C. The other end of the spring, bearing the roller, rides on top of the film when the reel is started and thus holds the contact segment away from the circuit point D, until the reel is nearly finished. As the film passes through the machine during the exhibition, the roller F gradually sinks toward the axle of the reel. Eventually the opposite end comes against the contact screw D, forming the circuit to the light, and signaling the operator.—A. F. Andrews, Chicago, Ill.

Adjustable Supporting Stand Substitute for Jackscrew

An adjustable stand, the construction of which is disclosed in the illustration, has been found very useful in the shop for supporting frames of machines, or similar objects, which are being assembled or repaired. It may be substituted effectively for the usual jack. It is safer than the latter and its first cost is lower. The base is a standard floor flange. The vertical column is a length of wrought-iron pipe, threaded at the end which screws into the flange. The movable shaft is another piece of pipe, its diameter being such that it will slide easily within the pipe column. A ⅜-in. pin, cut from cold-rolled steel, constitutes a key whereby the shaft may be held at any desired height. Equidistantly spaced holes, 7/16 in. in diameter, are drilled in the shaft and column for the key. The



The Stand Is Useful on the Assembly Floor. The Lock Is Positive and cannot be Released by Accident

key should be chained to the column so that it will not be lost. The head is turned from machine steel and has a

V-notch machined across its upper face. An annular groove is turned in its lower extension. Into this groove a setscrew with a dog point engages. The point of this setscrew should fit loosely in the groove so that the V-notch may be rotated to any desired position.

Electric Ignition System Wired to Counteract Loose Connections

Electrical ignition systems are frequently operated upon low voltages from primary batteries, storage batteries, or low-pressure generators. The power required is very small, and on this account batteries are much used. The primary voltage is generally about six volts and the series-multiple connection, shown in Fig. 1, is usually employed. If additional cross connections are made, as shown in Fig. 2, a loose connection in one series of batteries will not render the entire series useless.—Peter J. M. Clute, Schenectady, N. Y.

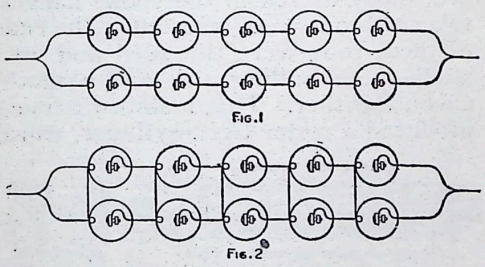


FIG. 1

FIG. 2

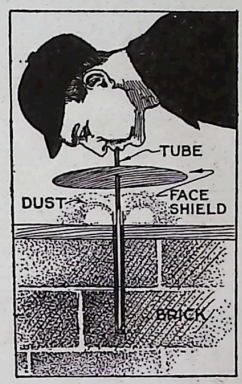
By Providing Cross Connections, the Entire Series is Not Rendered Useless Because of a Loose Contact

Fixing Compass-Point Centers on Drawing Sheets

When a large number of circles are drawn from the same compass center a hole is ordinarily worn in the paper. It thus becomes impossible to draw circles or arcs concentric with each other. To remedy this, glue a small piece of celluloid over the center to take the point of the compass. Such compass-point centers may be removed from the drawing, when completed, with a knife.

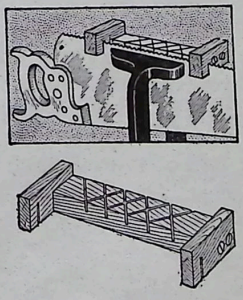
Holes Drilled through Brick and Mortar

In wiring an old house for electricity, the workmen had to drill a vertical hole through several layers of wood, brick, and plaster. The only tool that could do the work was a drill bit with a short auger section and a long shank. After the hole had been drilled a few inches it began to clog, as the fine dust would not lift out. It packed hard at the bottom of the hole and hampered progress. Then a short piece of tubing was thrust into the hole. When the workman blew into the tube, the dust came out in a jiffy. A shield of paper around the tubing protected the workman's face. The operation was repeated as often as necessary. — Dale R. Van Horn, North Loup, Neb.



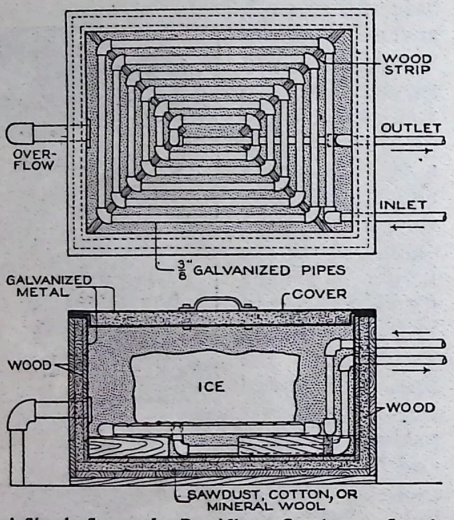
Guideboards Are Great Aid for Correct Saw Filing

The difficult job of filing a saw properly is rendered much easier by the use of an angle guide board, as shown in the drawing. Such a guide board is readily made from three pieces of wood. After being fitted over the saw blade the correct angles for filing are located with a ruler and pencil and made permanent with saw cuts. When filing the saw the file is kept in line with the guide marks, thus eliminating all guesswork as to the correctness of the angle of filing.



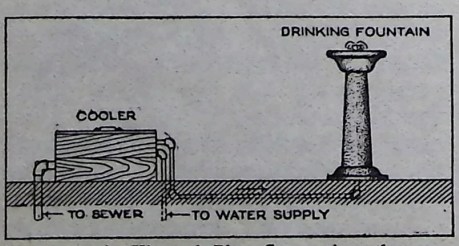
Cold-Water System with Cooling Coil in Supply Pipe

Any shop can have a continuous supply of cold drinking water by installing



A Simple System for Providing a Continuous Supply of Cold Drinking Water in a Shop

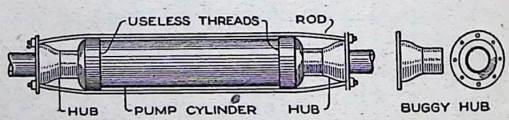
an equipment such as that shown in the accompanying diagrams. The cooling coil, which is inserted in the water-supply pipe to the drinking fountain, is assembled from malleable-iron elbows and pipe nipples. To prevent excessive radiation, heat-insulating materials are incorporated in the sides and cover of the box. Ice is packed on top of the cooling coil. Water which flows to the fountain is thereby cooled. An overflow pipe from the cooler leads to the sewer, to carry away excessive water from the melting ice. This cooler may be installed at any convenient location, but preferably should be near the fountain so that the temperature of the water will not be raised appreciably in flowing from the cooler to the fountain. It is desirable to inclose the pipe between the cooler and the fountain in a magnesia or similar heat-insulating covering.—C. C. Spreen, Flint, Mich.



Diagrammatic View of Pipe Connections between Cooler and Drinking Fountain, Water Supply, and Drainage System

Buggy Hub Used for Repairing Worn Threads of a Pump Cylinder

A farmer whose crops were threatened with injury because of the failure of an irrigation pump, effected the temporary repair illustrated. The threads of the cylinder caps had stripped, allowing the cylinder to pull apart and rendering the pump useless. An old buggy hub was cut in two, and the halves were passed over the jack rod, as indicated. Through holes previously drilled in the spoke flanges, two steel rods were inserted. The ends of these rods were threaded and nuts applied for pulling the entire mechanism together. This makeshift repair produced a water-tight cylinder, which



The Halves of a Buggy Hub were Used to Secure a Connection for Threaded Steel Rods Which Held Together the Caps of a Pump Cylinder from Which the Threads had been Stripped

gave satisfactory service until a new one could be procured.—C. C. Jackson, Roanoke, Ind.

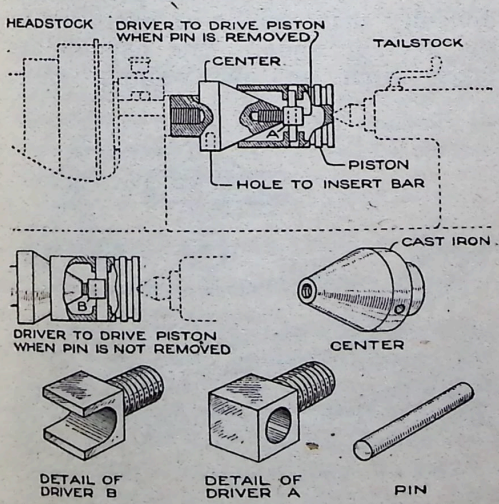
Chalking a Tap to Get a Perfect Fit

It is always desirable to get a perfect fit for steam, air, or water-tight work on studs, plugs, patch bolts, and similar jobs where tapered taps are used. A simple method of determining the exact size of a tapped hole is to chalk the tap with ordinary white chalk, and then run it into the hole. When the tap is screwed into the hole the chalk is removed due to the friction of the metal against the tap. After the tap has been run in as far as it will go, it is taken out. The chalk will not show on the tap up to the

point where it went in. By calipering the tap where the chalk begins the thickness of the metal around the tapped hole is determined, and the stud, plug, or patch bolt is turned up accordingly.

Chuck Which Centers and Drives Pistons being Machined in Lathe

Where a number of pistons are to be machined in a lathe the arrangement illustrated will greatly simplify the setting-up operation, inasmuch as it centers automatically the piston in the tool. Furthermore, the driving device suggested transmits effectively the rotary motion from the lathe head to the casting which is being turned. The conical center, which is of cast iron, is threaded so that it will screw onto the lathe spindle. This construction, though convenient, is not necessary, for the center may instead be clamped in the lathe chuck. Either one of two driving devices may be employed. If the pin cannot be removed from the piston, the driver may be of the form detailed at B. When the pin can be removed, a driver of the design shown at A can be utilized. A hole should be drilled in the center casting into

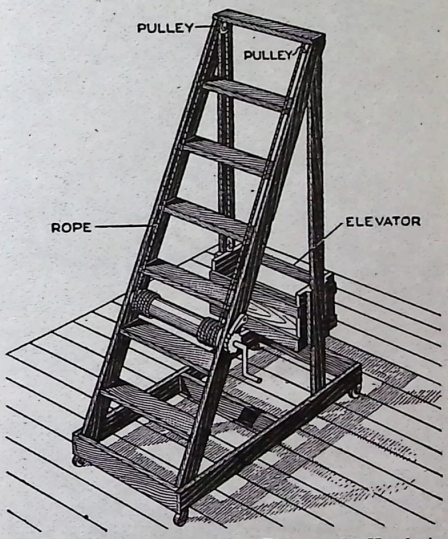


The Tapped Hole in the Nose of the Lathe Center Automatically Centers the Casting and Holds It for Machining

which a lever is inserted when unscrewing the center.

Combination Stepladder and Portable Elevator

This device is a combination of an elevator and a stepladder. When used as a stepladder, or scaffold, it can be



This Combined Ladder and Elevator Is Handy in the Store or Shop, and can Also be Used by a Fruit Picker or a Brick Mason

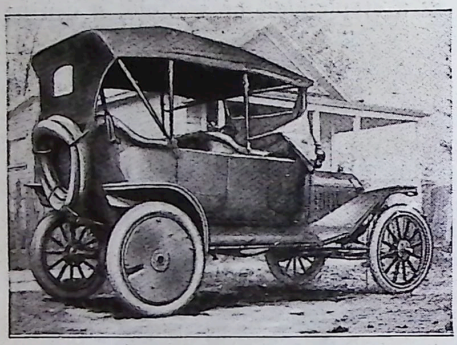
moved readily from place to place on its rollers. As an elevator it can be employed for raising to high shelves, for storage, relatively heavy loads, such as sacks of flour or cases of canned goods. However, its most useful application is, probably, in gathering fruit. The gatherer has free use of both hands and the fruit can be placed in the crate on the elevator. In masonry construction, bricks can be carried in the elevator box so that they will always be at a convenient height for rapid handling.—R. Lee Sharpe, Carrollton, Ga.

Dehydrating Denatured Alcohol

To remove excess water in 190° denatured alcohol, I added 4 oz. calcium carbide to each gallon of denatured alcohol. After the bubbles of acetylene gas had ceased, I filtered the alcohol in a funnel and obtained a practically water-free alcohol.—Leon A. Haloin, Denver, Colo.

Effective Emergency Repair for Automobile Wheel

In the photographic reproduction is shown how a broken automobile wheel



The Right Rear Wheel of This Automobile is Made from Three Wooden Disks Fitted to the Old Hub and Felloe, After the Spokes had Broken. The Car was Driven 250 Miles with It

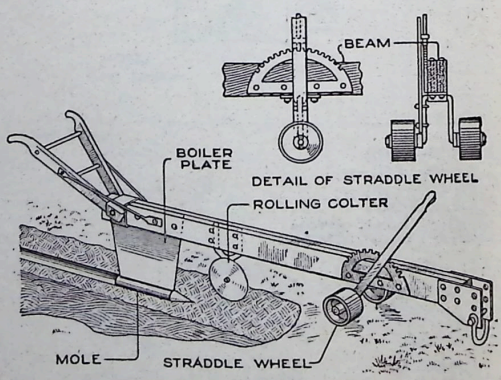
was quickly and effectively repaired on the Valdez Trail, Alaska, 150 miles from any automobile-supply station. After the repair, the machine was driven without failure over bad roads for 250 miles. In constructing the improvised wheel, six pieces of board, each 1¼ in. thick, and the old felloe were used. The only tools employed were a brace and bit, a saw, and a hammer. The six boards were assembled and sawed into three disks giving a total thickness of 3¾ in. The boards were so placed that the grain of the wood crossed in adjacent layers. Two of the wooden disks were of the same diameter as that of the outside of the felloe. The inner disk was sawed to fit tightly inside of the felloe. Six bolts passing through the felloe and two outer disks clamped the parts together. A hole was bored through the center of the three disks for the hub. The old hub was used, with spoke flanges on the outside. A notch was cut in the outside and center disks to permit access to the tire valve. Then the wheel was ready for use. It required only two hours to build it. A small piece of board with a nail driven in each end was used as a compass for striking the circles.—John S. Griswold, Fairbanks, Alaska.

Iron Cement Made from Old Dry-Cell Filler

The black filler material from old dry cells, when combined with powdered iron and Portland cement, makes an excellent iron cement which is suitable for a variety of purposes. The proportions are: cement, 15 oz.; powdered iron, 20 oz.; battery filler, 5 oz. All this material must be perfectly dry when mixed and as fine as possible. Any moisture will set up a chemical action that will set the mixture. Cement powder will keep indefinitely if stored in a dry place. When desired for use, it is only necessary to add water to make a thick paste and apply.

Mole Plow Makes Subsurface Drain without Use of Tile

The mole plow shown in the sketch has been used successfully for draining the ground about several American army cantonments and by farmers in the cultivation of low, marshy land. The mole, which is made of hardened steel, makes a 4-in. hole 15 in. to 18 in. underground as fast as the plow can be drawn along by horses or machinery. Its construction presents no difficulty that cannot be overcome in the average shop. The handles are taken from an old walking plow,



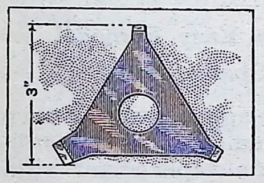
Boggy Ground is Quickly Drained through the Underground Hole Left by the Passage of the Steel Mole

while the straddle wheels and lever for controlling same are from a grain

binder. This mechanism serves to regulate the depth at which the plow is to travel. The rolling colter, like the plow blade, is made from a piece of boiler plate. Its function is to cut all roots and sod in the path of the plow blade. —E. R. McIntyre, Madison, Wis.

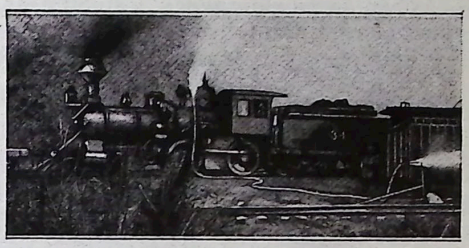
Triple-Bladed Pocket Screwdriver

A pocket screwdriver like that here illustrated costs practically nothing to make, weighs little, and occupies a minimum of space in the tool chest or pocket. On the other hand, with it, most of the operations possible with larger screwdrivers can be effected. It offers instantly the proper-sized blade for each ordinary size of screw and provides a leverage entirely out of proportion to its size. A triangular piece of tempered steel, about ⅛ in. thick, is the only material needed. It can be shaped hot—or cold with a hacksaw. If a hacksaw is used, the ⅛-in. steel plate should be first annealed. Round off the edges between the blades and temper the blade points. A length between base and apex of about 3 in. will be found most convenient. If the tool is made of these proportions, it is possible to grasp it firmly without the points interfering; they will be entirely clear of the hand.



Locomotive Steam Used to Clean and Sterilize Well

Steam generated by a locomotive was, after other methods failed, used successfully for cleaning and sterilizing a well located on the line of a western railroad. A steam ejector was screwed on the lower end of a pipe, as detailed in the accompanying drawing. Then this pipe was lowered into the well casing and held with ropes so that its lower end came within about 4 in. from the bottom of the well. A flexible hose, as shown in the photograph, fed the steam supply from the boiler to the



By Connecting a Flexible Hose from the Locomotive to an Injector Immersed in a Well, the Latter was Effectively Cleaned of Sand and Mud

ejector. As the steam was permitted to flow through the apparatus discharging the water, workmen stirred the bottom of the well with poles. Thereby the sand and mud which had accumulated was caused to rise and, together with considerable water, was ejected through the discharge pipe. The water was heated almost to a boiling temperature. After the discharge had been operating for three hours, the water which flowed out became clear and clean, indicating that the job had been completed.

A previous attempt made to clean the well with steam from a pile driver was unsuccessful because of the relatively low steam pressure which its boiler developed.—H. H. Isard, Caliente, Nev.

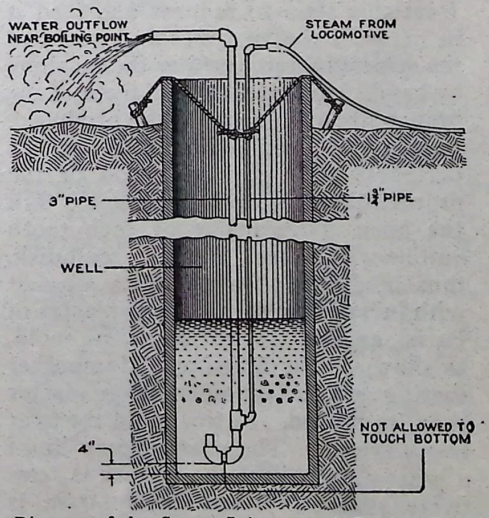
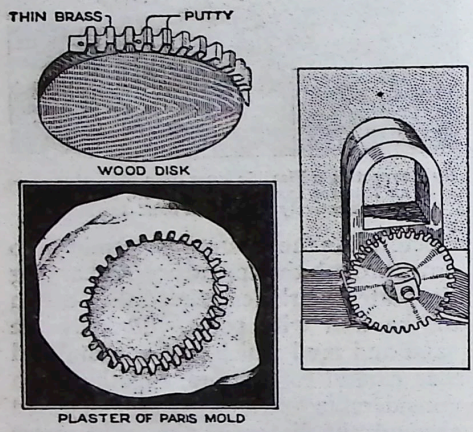


Diagram of the Steam Injector and Outflow Pipe, and the Manner of Its Suspension in the Well

Making Emergency Gear Patterns

When, in an emergency, a small gear must be cast, the following method can be employed. Estimate the diameter



Pattern and Mold for Small Gear, and, at the Right, Small Gear Cast by This Method

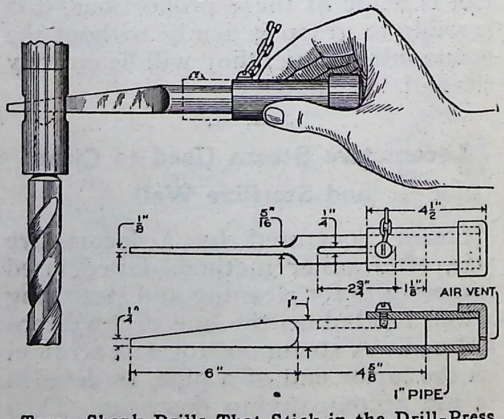
and number of teeth in the gear required. Find two meshing gears, on some operating machine, the pitch of which is the same as that required of the gear to be cast. Then cut a strip of thin brass to a width equal to the face, or thickness, of the gear required. Heat this strip to redness and feed it in between the two meshing gears of the selected pitch, turning the machine by hand. Thereby a strip of teeth of the proper size and shape will be produced. Fasten this strip, with brads, on the periphery of a disk of wood of the proper diameter and thickness. Fill the open space inside of each tooth outline with putty. Use the wood disk, thus modified, as a pattern. Coat it with lubricating oil and pour plaster of Paris around it to form a mold, as shown in the drawing. A smoother casting will be obtained from plaster than from sand. In this mold the gear blank is cast. The casting may be of a brass alloy where the service is relatively severe. Where little strain is imposed, or for experimental work, the blank may be cast of zinc or babbitt, both of which melt at low temperatures. —Arthur A. Richardson, Barnstead, New Hampshire.

Solder Paste for Difficult Fluxing

A paste, prepared as follows, will flux whatever it touches at once; will stick to cast iron, and work in out-of-the-way places. Take half-and-half bar solder, and reduce it to coarse filings. Figure this as 100 parts by weight. Add 10 per cent zinc chloride, in dry powder form, and three per cent powdered sulphate of copper. Wet this mixture with water and glycerin, sufficient to mix it thoroughly. Add about five per cent common vaseline to give it paste form. Apply in any way convenient. The paste will keep the soldering iron in good shape.—Robert C. Knox, St. Petersburg, Fla.

Drift Tool for Easy Removal of Taper-Shank Drills

One of the most aggravating of shop practices is the removal by the ordinary methods of a taper-shank drill that has become wedged in the socket of a drill press. Such drills may be readily removed, and with slight effort, with the aid of the homemade drift tool illustrated. The tapering wedge is made from a piece of shaft steel of the dimensions indicated. The pounding member is a length of pipe and a pipe cap, combined with the wedge part as shown. A length of chain secures the



Taper-Shank Drills That Stick in the Drill-Press Socket are Quickly Removed by a Few Taps with This Drift Tool

tool in a position always handy to the drill press. The wedge is inserted in

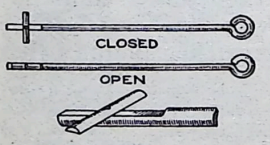
the slot at the base of the shank hole and one or two blows with the sliding handle is usually sufficient to dislodge the most stubborn drill.—C. S. Springer, Detroit, Mich.

Loosening Rusty Wood Screws

Wood screws that have become so badly rusted that they cannot be moved by ordinary means may be loosened by heating them. This may be done by applying a hot soldering iron or poker to their heads. The expansion and contraction caused by the application of the hot iron and its subsequent withdrawal will usually loosen them enough so they may be removed with a screwdriver.—J. C. Bailey, Whiteland, Ind.

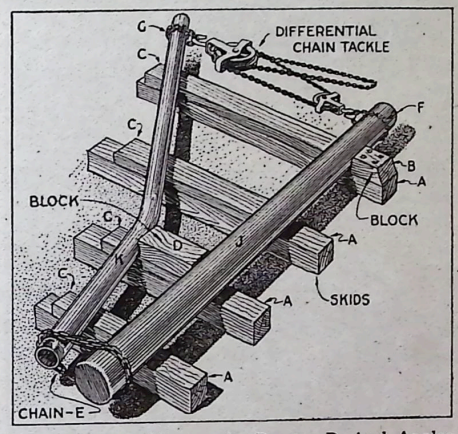
Rod for Holding Scissors Blades While Polishing

An improvement over the usual heavy-gauge wire for holding a number of shears and scissors blades while buffing is made is indicated in the sketch. A loop prevents the blades from sliding off one end. The opposite end is opened or closed as may be desired by a pivoted metal block. Such a rod is easily constructed. Two cuts with a hacksaw remove the piece that is to form the block. The parts are then drilled and riveted together loosely enough to permit the block to be turned.—Harry Seaman, Newark, New Jersey.



Apparatus of Simple Construction for Bending Heavy Pipe

Heavy pipe can be straightened or bent to any angle with the aid of a few planks and a differential block and tackle. The skids A are distributed on a flat surface and the block B is spiked in place. If the pipe K, which is to be straightened, is 4 in., and the pipe J, 6 in. in diameter, the boards C should be an inch thick so as to bring the center line of the smaller pipe level with

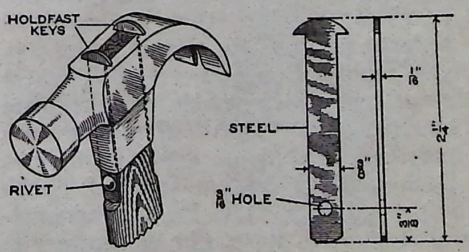


Pipes of Large Size can be Bent to Desired Angles or Straightened Readily with Little Labor with This Outfit

that of the larger one. This done, the members are chained together at one end, as shown at E, and the block D is inserted as a wedge. The differential is attached to chains at F and G where the greatest leverage is offered. When pipe of considerable size is handled, application of heat at the bending point is requisite.

A Hammer-Head Holdfast

To make this holdfast, which provides a positive method of preventing a hammer head from flying from its handle, cut out, with a hacksaw, from 1/16-in. strap iron, two keys of the dimensions shown in the detail drawing.



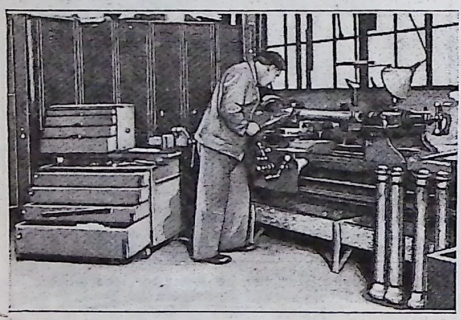
By Fitting a Hammer with Keys, as Shown Here, There will Be No Danger of the Head Flying Off in Use

Drill a hole through the hammer handle and the keys in the position indi-

cated. Insert a rivet; head it over, and the device is finished.—P. P. Avery, Garfield, N. J.

Portable Tool Chest and Workbench is Easily Moved about the Shop

Men whose work takes them from one part of the shop to another are



The Portable Tool Chest Permits the Workman to Carry His Tools and Vise to Any Part of the Plant in Which His Services are Needed

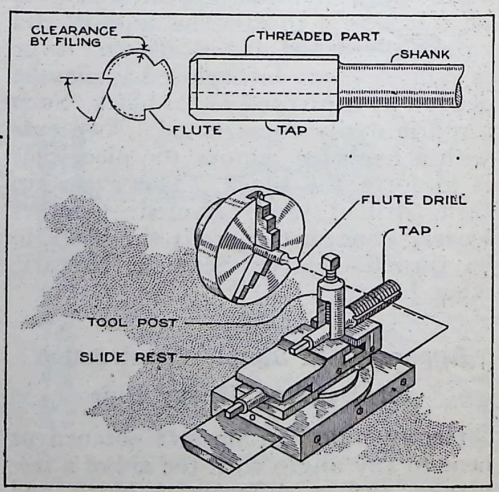
spared much hard labor and the loss of valuable time by the use of a portable tool box similar to the one shown in the photograph. The chest illustrated was built for the use of a machinist whose work takes him from his lathe to every portion of a large manufacturing plant. Like most practical mechanics he prefers to use his own tools. The eight drawers of various sizes contain every tool of his requirement. Although the chest and its contents weigh several hundred pounds, it may be moved about over the concrete floor with but little effort. The casters are large enough to pass over slight imperfections in the floor, while the roller bearings on which they are mounted reduce friction to a minimum. A vise mounted on one end of the chest saves many steps and a proportionate amount of time. All of the drawers may be locked by hasps that swing into latches at the bottom and lock above with padlocks. The locking arrangement for the upper tier of drawers is mounted on the back, where the hasp engages a set of protruding latches. For convenience in moving, steel handles are provided at both ends of the chest.

Solution for the Removal of Paint

Potassium hydroxide, dissolved in water, is an excellent paint remover. The solution is applied to the painted surface with a brush, or cloth, and allowed to stand for several hours. It may then be rubbed off with a cloth, and the paint will come with it. If all the paint is not removed the first time, a second application will usually accomplish the purpose.—H. W. Offins, Grants Pass, Ore.

Method of Milling Flutes in Taps and Reamers

For work in which a special tap or reamer is needed and when no milling machine is available, the job may be fluted in an ordinary engine lathe, or even in a speed lathe, provided it is equipped with a slide rest. The upper sketch shows the appearance of the tap after being fluted in the lathe. The lower drawing shows how the tap is held in the tool post. A strong, flat drill, ground to the proper angle, is held in the chuck, as indicated. The tap must be set in such a manner that



Taps and Reamers may be Fluted in Any Slide-Rest Lathe with a Flute Drill That is Readily Ground to Shape

the center line is considerably below the center of the flat drill or cutter. To

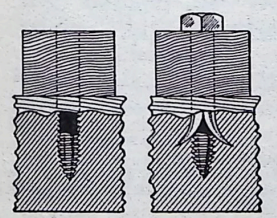
mill the tap, it is fed against the point of the cutter, as illustrated.—J. Limbrunner, Sheldon, Conn.

Tin-Coating Steel Lever and Wheel Handles

Grind or file the part to be coated. Immerse in muriatic acid for three to five minutes; then in a bath of pure tin for 20 to 25 seconds. Wipe the coated part, while hot, with soft flannel cloth so as to make the coating even. The tin should be heated so it will singe a piece of pine wood if inserted in it.

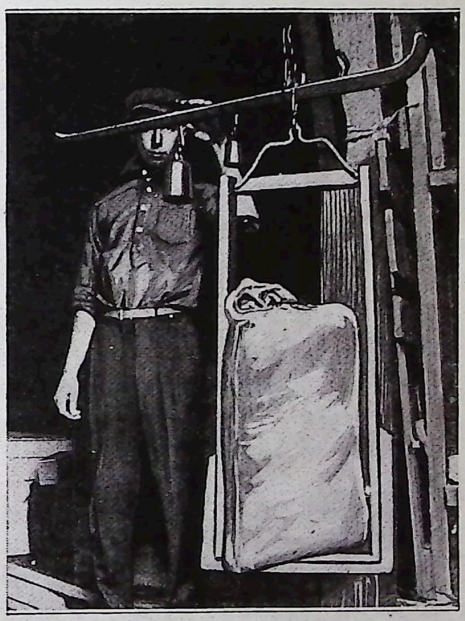
Setting a Lag Screw in a Hole Containing a Broken Point

When a lag screw breaks off in a hole and cannot be readily removed another screw may be set securely in the same hole by the method illustrated. The threads are dressed off the new screw with a file, and with a hacksaw the point is split a distance equal to the depth to which it would normally enter the wood. The points are then spread slightly and the screw driven home with a hammer. When the points of the new screw strike the broken piece they will spread out, taking a firm hold in the wood. Care should be used to cause the new screw points to spread with the grain of the wood to avoid splitting.—Walter H. Wolf, Londonville, Ohio.



Useful Platform for Weighing Sacks on Steelyard Scales

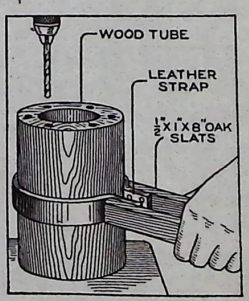
The utility of the old-fashioned steelyard scale can be increased by building a light platform on which sacks of grain and other articles that require a support can be swung from the steelyard. A strong platform, weighing about 12 lb., is made, and is easily carried from building to building as needed. A short piece of chain may be used to hang the steelyard from a rafter or a hook on the wall.—H. W. Stanley, Chicago, Ill.



Steelyard Scale Fitted with Platform, So That Sacks of Grain or Other Bulky Articles can be Weighed on It

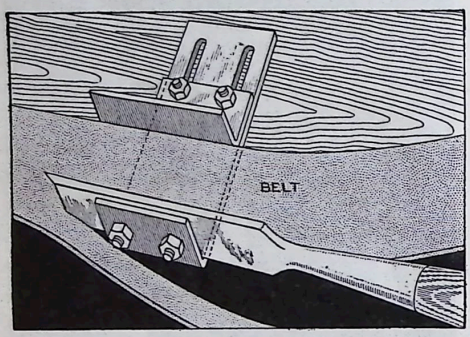
Handle for Holding Polished Round Stock for Drilling

In a large factory a rush order was received which called for countersinking several holes around the top edges of a large number of wooden cylinders. As the tubes were polished and varnished they were difficult to hold while drilling. This difficulty was overcome by the use of the simple gripping fixture illustrated. The strap is made just long enough to allow a little space between the handles when they are grasped firmly.



A Serviceable Homemade Tool for Trimming Belts

Many old belts may be trimmed down, or split, and made to give in-

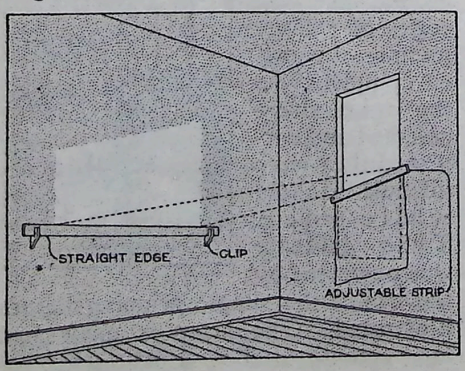


By Providing an Ordinary Wood Chisel with a Simple Metal Guide It may be Used as a Tool for Trimming Leather Belting and Similar Stock

definite service on smaller machinery. An excellent tool for trimming such belting is made from an old chisel, as illustrated. Two holes are drilled through the blade and through these holes bolts are passed to fasten a piece of steel, bent at right angles and slotted as shown. A second piece of steel, bent at right angles, is bolted through these slots, and when tightened in place, serves as a guide for governing the depth of the split to be made.—Charles H. Wiley, Concord, N. H.

Utilizing Sun's Rays for Truing a Straightedge

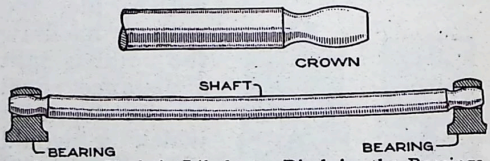
I had occasion to use a long straightedge, but no means for truing it was available. Finally, I thought of using the rays of the sun, shining through the window, to define a long straight line. Accordingly I mounted an adjustable strip on a window sash, as shown in the illustration, just so high that the rays over its edge cut along the top of the location where I mounted the straightedge. Thereby a long straight line was indicated and the straightedge was trued.—H. A. Trester, Milwaukee, Wis.



The Sun Shining through the Window at the Left Defined a Straight Line on the Side Wall, along Which the Straightedge was Trued

Making a Sprung Shaft Self-Alining

Because too much load was carried in the middle of some shafts, they sprung and bound in the bearings. By crowning the journals, a good bearing surface was had at any load. The spring of the shaft is indicated in the picture, and even with this amount of deflection, the shaft revolved freely. Of course, a shaft turning at high speed



A Sprung Shaft is Likely to Bind in the Bearings. If the Journals are Crowned as Shown, Little Trouble of This Kind will be Experienced with a Slow-Speed Shaft

or under a heavy load could hardly be expected to give satisfaction under such conditions. In the case of the shaft illustrated the speed was but a few revolutions per minute.

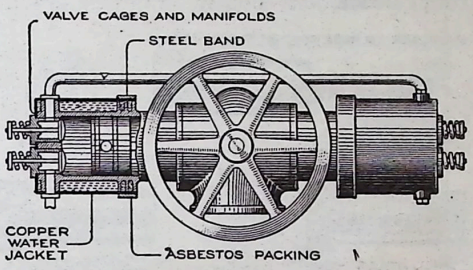
Reducing Waste in Breaking Tool Steel

As high-speed steel is very expensive and scarce, the following kink will be helpful in preventing waste. In most cases the machinist cuts off a length from the bar, and shapes the steel. Usually he grinds the bar on an emery wheel, and makes two cuts, one from each side, so the cross section of a cut is like an "X." This is wasteful. The right way is to make a single V-shaped cut from one side to the other.—Alfred Danyard, Detroit, Mich.

Water-Jacketing an Air-Cooled Motor

By E. E. STEVENSON

An air-cooled, two-cylinder, four-cycle automobile motor of conventional design was installed in a small speed boat. Its service was satisfactory except that it heated excessively after a half hour's operation. The heating was due to impaired air circulation. A water-cooling jacket, arranged as will be described, corrected the difficulty satisfactorily. All of the air flanges on each cylinder except the three nearest the flywheel were turned off in a lathe. Then these three, together with the inlet and exhaust-manifold bosses, were machined to a common true diameter, which was also the exact inside diameter of the sheet-copper water jackets which had been provided. Each jacket comprised a cylinder of sheet copper, 1/16 in. thick, with a disk of the same material brazed into one end. The spaces between the three remaining flanges on each cylinder were packed with asbestos cordage and red lead. Then the copper jackets were gently pressed onto the cylinders. Steel bands were shrunk on over them at the flywheel ends, clamping them snugly to the remaining flanges. Holes were cut in the jackets for the valve cages, and the intake and exhaust manifolds, and also for their respective tap bolts. These parts being securely

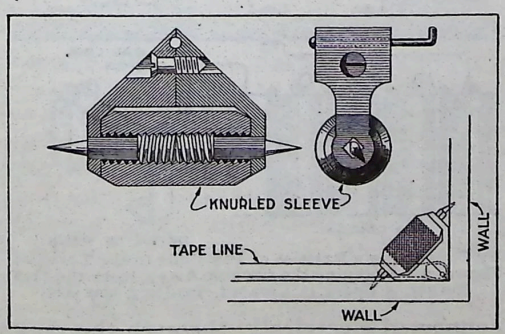


By Removing Some of the Flanges on the Cylinder of an Air-Cooled Motor, Fitting Sheet-Copper Water Jackets in Place of the Removed Flanges, as Shown, and Providing a Pump and Proper Connections, the Engine was Converted into a Water-Cooled One for Use in a Speed Boat

clamped to the cylinders, water-tight joints were thereby provided between the cylinder walls and the copper water jackets. To circulate the cooling water, a geared pump, not shown in the illustration, was fitted to the end of the cam shaft. A supply pipe was arranged from the pump to each jacket and a discharge pipe was installed from each jacket through the side of the boat. Operation of the pump forced cool water through the jackets, thereby maintaining the cylinders at a reasonably low temperature.

Tool for Holding Tape Lines in Corners

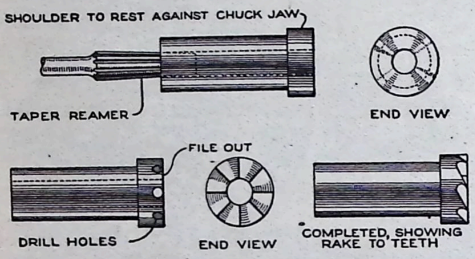
In measuring interiors unassisted, it is often difficult to hold the end of a tape line in a corner. This difficulty is quickly overcome with the fastening tool illustrated. The tool is made up from any grade of steel that is soft enough to be easily worked. It is provided with a hook for affixing the tape line to it. A knurled cylinder turns on an axle composed of two hardened steel pins, pointed at the ends and operating an interior two-way thread. The angle end of the tool is placed in the corner from which the measurements are to be taken. A turn or two on the knurled cylinder expands the pins, driving their points into the woodwork. The end of the tape line is then attached to the hook on the tool as in the sketch.—John R. Wiggins, Baltimore, Md.



This Tool may be Instantly Hooked in Any Corner to Provide a Fastening for Tape-Line Measurements

Hollow Mill for Making Wooden Knitting Needles and Dowel Pins

Often it is desired to turn pins that are too light to run on centers. The tool described below handles such



Hollow Mill, Made from an Old Rifle Barrel, for Turning Pins and Other Objects Too Light to be Held on Centers in the Lathe

work well, and gives a good finish on hard wood.

A piece of an old .22-caliber rifle barrel is very adaptable material. Cut off about 1½ in. of the barrel or other suitable material. Ream out all traces of the rifling. Then face the piece in a lathe, and turn a collar at one end, to hold the tool in the chuck. At this end lay out and drill a series of holes at right angle to the bore. These holes form the throat of the teeth, which are completed by filing away the wall of metal between the holes and the end. When the teeth have been formed, a taper should be run in from the back, to give clearance and remove the burr left in drilling the holes. I have made these hollow mills from ¼ in. to ½ in. for use on brass and mild steel. The method of forming the teeth gives a good rake which makes them cut quickly. The holes at the root of the teeth aid in clearing out the chips or cuttings.

The hollow mill can be used in a variety of ways. If the lathe has a hollow headstock, the mill is placed in the chuck, and the wood is placed against a tool in the tool rest. It is necessary, of course, to plane down the end of the stick so it can be fed into the mill. If the headstock is not hollow, the wood can be held in the chuck and the mill clamped on the tool post. The mill can even be clamped in a vise, and the wood secured in the jaws of a breast drill, and rotated rapidly.—B. E. Dobree, Battleford, Sask., Canada.

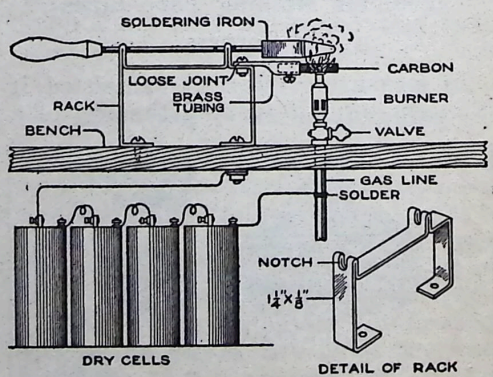
Softening Hard Iron and Brass Castings

A lot of iron castings to be machined were found to be extra-hard, and it was impossible to find tools that would stand up on them. We put a batch into a furnace until they were red-hot, and let them cool. Then they were machined with ease.

A similar treatment was adopted for brass castings for valve rings. They were hard and brittle, and would break under slight pressure. We put the castings in a furnace and burned out the excess tin. Machining was easy after that.—R. Thomas, Cheyenne, Wyo.

A Self-Lighting Gas Soldering Torch

How a gas soldering-iron torch, which requires no matches for its lighting, can be made is described graphically in the illustration. When the carbon is swung over the top of the gas burner, it contacts momentarily therewith, and when the circuit is broken, as the carbon is swung on around, a spark results. This, if the gas valve is open, ignites the gas. The carbon is



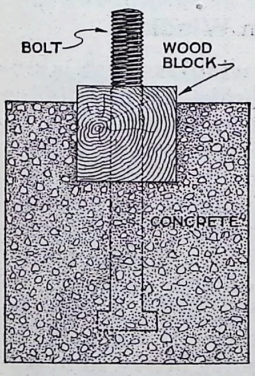
By Connecting a Battery of Dry Cells to the Torch as Shown and Swinging the Carbon Away from the Gas Burner, a Spark is Created, Igniting the Gas

connected electrically through the rack to one terminal of a battery of dry cells.

The opposite terminal is grounded on the gas pipe. Although not always necessary, a spark coil connected in series with the batteries will increase the effectiveness of the arrangement. The carbon is supported in a piece of brass tubing which is flattened on one end to provide for the insertion of the screw on which this holder is pivoted. The rack, shown in detail in the drawing, is bent from 1¼ by ⅛-in. strap iron.

Alining Hold-Down Bolts in Concrete Foundations

When concrete bases are designed for machine foundations and column footings, hold-down bolts must be cast into the concrete. It is frequently difficult to place the bolts accurately enough to fit the foundations. If the holes in the foundations are not slotted to allow for slight inaccuracies in placing the bolts, the following simple expedient will be found practical.



Set the bolts into the concrete, and provide a drilled wooden block for each bolt, several inches thick and large enough to suit. The concrete is poured with the blocks so placed on the bolts as to make a shallow, narrow pit in the concrete. Remove the blocks before the concrete sets. The purpose of the pit is to permit the bolt to be bent slightly in any direction. In this way the bolts can be set to fit the holes in the machine foundation or column base. The pit made by the block is filled with concrete when the bolts have been fitted to the base. The block must not be left too long in the concrete, or the wood is apt to swell, making it difficult to remove.—S. B. Royal, Baltimore, Md.

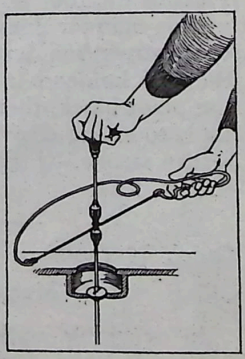
Flexible Scraper Makes Difficult Jobs Easy

Scraping corners is difficult where glue is used, as where the sides of a table are butted against the legs. The glue squeezes out, and there is danger of marring the wood and tearing out slivers when a common scraper is used.

A flexible scraper made of saw steel can be pressed flat against the work, while the hand has a good grip on the free end. It is impossible to cut deeper than the rolled edge, or to enter the joint. Use a piece of No. 26 gauge saw-blade steel, cut 2 in. wide by 6 in. long, which can be bought at any large hardware store. It can be cut with tinners' snips.

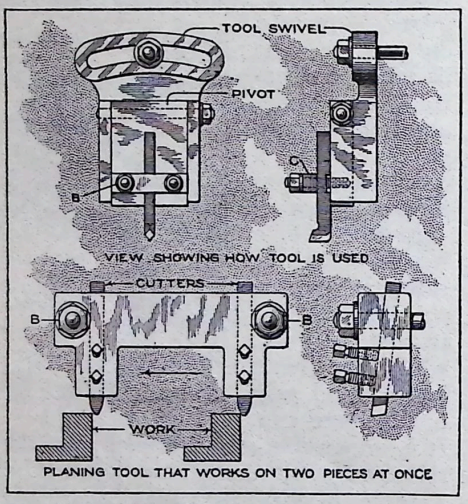
Useful Kink for Valve-Grinding Jobs

In case it is impossible to use a bit and brace to rotate the valve, motion may be given by a bow drill. Arrange a screwdriver with a pulley in the center, and a handle that will permit the shank to rotate. Make the bow by looping a piece of heavy iron wire. Then connect the ends of the bow with heavy cord, making a full turn on the pulley with the cord. This plan makes it possible to keep an even pressure on the valve and an even movement in both directions.



Planing Tool for Machining Two Parts at Once

It is often profitable, on work that will permit it, to plane two parts at



Two Pieces of Work are Planed Simultaneously by the Use of This Simple Two-Cutter Planing Tool

once. This may be done very cheaply by equipping the planer as shown in the sketch. The tool holder is made by removing the strap C and the nuts B, which is followed by putting the tool holder containing the two cutters over the studs. These two tools now plane two parts in the usual manner by being fed across the work in the direction indicated by the arrow. Placing the tool holder over the studs in this manner does not interfere with the clapper-box feature of planing, as the tool holder is mounted directly on the pivot block, thereby permitting the tools to swing clear of the work on the return stroke.—J. Smith Higgins, Pawtucket, R. I.

Quick Methods of Converting Metric Measures

In working with metric measurements I have found the following methods practical in changing metric and other standards to their approximate equivalents in English standards.

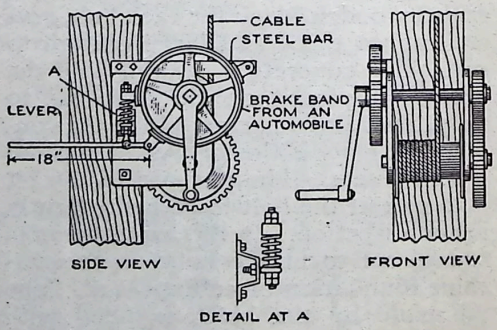
To bring centigrade degrees to Fahrenheit, double the figure, deduct 10 per cent, and add 32. Example: 30° C. doubled is 60; less 10 per cent is 54; adding 32, gives 86. Another example: 100° C. doubled is 200; less 10 per cent is 180; adding 32 is 212°, the boiling point in the Fahrenheit scale.

To bring millimeters to inches, accurately enough for general purposes, multiply each 100 millimeters by 4, drop off the required number of ciphers, and the result will be in inches. Example: 150 millimeters multiplied by 4 is 600; dropping the ciphers gives 6 in., which is approximately correct.

To bring meters to feet multiply by 3 and add 10 per cent. To bring kilograms to pounds multiply by 2 and add 10 per cent.—Victor A. Rettich, New York, N. Y.

Old Automobile Brake Adapted for Use on Windlass

The handle of a windlass that is unprovided with a brake is usually as treacherous as a bucking broncho when heavy loads are being lowered. Such a windlass may be made as docile as a kitten by fitting it with an old automobile brake as illustrated. The brake-control lever should be placed within convenient reach of the operator, so that once the load is lifted it may be locked in any position. If the loads to be lifted are sufficiently heavy to neces-



With the Brake, the Load Handled by the Windlass is Held Securely in Any Position

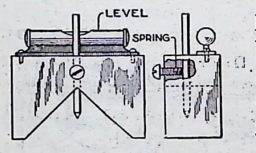
sitate the use of both hands, a foot control on the brake will be found convenient.—Samuel J. Knox, Portland, Oregon.

Swinging Door in Sliding Door Saves Employes' Time

Heavy sliding fire doors are extensively used as factory exits, and in fire walls. These doors are generally kept closed to eliminate drafts and economize heat. An employe must open these heavy doors in passing from department to department, thus wasting time. The remedy is to fit a small door in the sliding one. The small door is closed with a spring, easy to operate, and does not interfere with the automatic operation of the heavy sliding fire door.

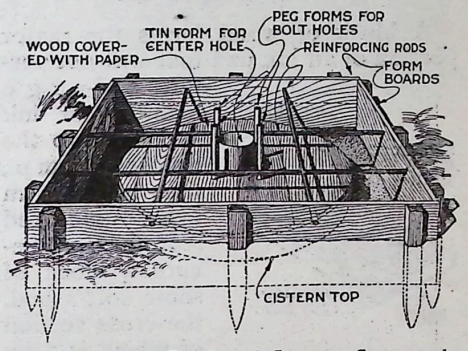
Tool for Laying Out Keyways

A tool useful for laying out keyways, or centers, on cylindrical pieces can be made by mounting a small level on a V-block, as shown, and adding a locating prick punch which extends through a hole drilled in the apex of the V-groove. The punch is not held rigidly by the screw, but is restrained by the friction of a spiral spring. With the tool level on the shaft, a tap with a hammer on the punch will form a prick hole at the vertical position in the shaft. To verify the accuracy of the tool, it may be reversed and another prick mark made, which can be compared with the first.—J. H. Rouse, San Francisco, Calif.



Reinforced-Concrete Cistern Cap

A cap for a cistern can be made easily of reinforced concrete, as will be described. A cover of this material has the advantage that it will withstand the effects of the elements indefinitely and that it will not foul the water. The procedure is this: Fit planks over the opening of the cistern. Then lay a sheet of heavy paper over these boards. This prevents the concrete from sticking to the wall or leaking through the cracks. Arrange the form boards, which should be 4 or 5 in. high around the outside, as shown in

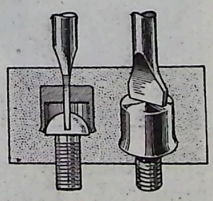


Form for Casting Reinforced-Concrete Cap over the Top of the Cistern on Which It is to be Used

the drawing, and support them in position with stakes. Then bend a strip of sheet iron into a hollow cylinder of sufficient diameter to admit the pump cylinder. Set this form in the center to provide an opening for the pump. Place heavy iron rods for reinforcing, in the form, as shown, and fill the form with concrete. Before the concrete has set push into it vertically, down to the wooden cover, four cylindrical sticks of wood. These should be located to correspond with the bolt holes in the pump base. After the concrete has set remove the form boards and bore out the cylindrical wooden rods.—Stanley Dougan, Pawnee, Okla.

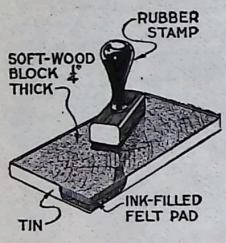
Self-Centering Nonslipping Screwdriver Head

If the point of a screwdriver which is used for driving screws of only one diameter is fitted with a bell, as shown in the sketch, the slipping of the edge of the driver from the slot will be prevented. Furthermore, the bell automatically centers the blade in the slot, promoting rapid work. The bell may be formed from sheet metal, but for continuous use one turned from bar stock will prove more economical.—P. J. Backus, Delphos, Ohio.



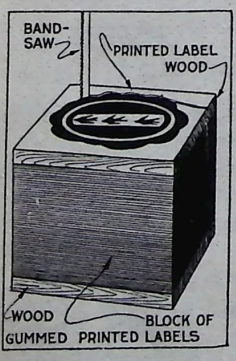
Handy Rubber-Stamp Ink Pad for the Shop Office

A block of wood forms the major portion of an ink pad that will not permit a large quantity of ink to adhere to the rubber stamp, thus insuring an even, unblurred reproduction. Secure a block of some soft wood, the cross section of which is 2 by 4 in. Saw a section of this across the grain so that the piece secured will be ¼ in. thick. This piece is then placed in the tin lid from a cocoa can with a layer of felt under it, as shown in the sketch. The ink is placed in the felt and is carried through the grain of the wood by capillary attraction. It will be found that just the right amount of ink comes through the wood to ink the rubber stamps properly.



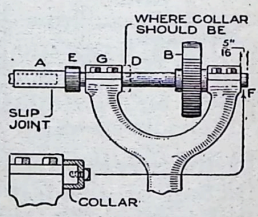
Band Saw Cuts Out Paper Labels of Irregular Outline

A printer who produces many labels of irregular outline employs a band saw for cutting out a thousand of them simultaneously. Thereby the cost of and the delay in obtaining a die is obviated. This is a decided improvement over the method of cutting a few at a time. Here is the procedure: Assume that a consignment of approximately round labels is to be produced. Print all of the labels on square pieces of paper of uniform size. Cut two blocks of soft wood, as illustrated, of the same size as the labels. Place one wooden block at the bottom and the other on the top of the pile. Pad the blocks and the labels together with strong glue. Paste on the top block one printed label which will serve as a guide when cutting. Now cut with a fine band saw around the outline of the label. About one thousand may be cut with the saw at one time. Heart-shaped, octagonal, or any other irregular contours can be cut as readily as can the approximately round label reproduced in the illustration. With a suitable saw the finished product is perfect and the cost is very low.

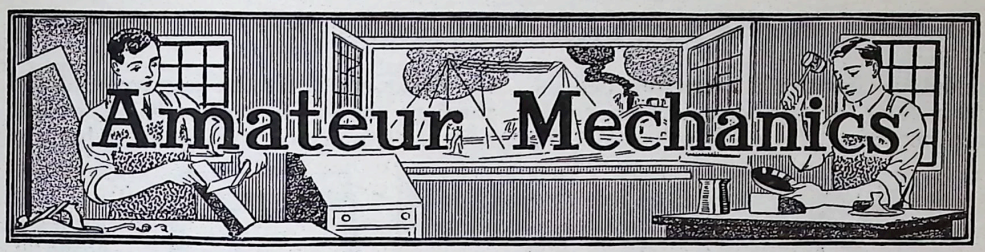


Collar for Flue-Cutter Slip-Joint Shaft

It was necessary to provide a collar on a flue-cutter shaft to prevent longitudinal movement of the shaft, because without the collar the shaft would work over so far that the belt slipped from the pulley B. The machine could not be taken apart to place a set collar at D where it should, under ordinary conditions, be located. A clamp collar might have been used, but this would involve the installation of a guard for it. When the shoulder E was close to the box G there was not enough shaft exposed at F to accommodate a set collar. The small detail at the left shows how the problem was solved. A cap of 2-in. outside diameter was made. It was counterbored 5/16 in. to fit over the shaft and was held in place by a screw turning into a tapped hole in the end of the shaft, as shown. This screw has a round head to prevent its catching on objects and is pinned to prevent it from turning out. Thus an effective "end collar" was provided. — A. G. Corssen, Centralia, Ill.



¶To learn sign and show-card painting, one of the best books to get is a type catalog.

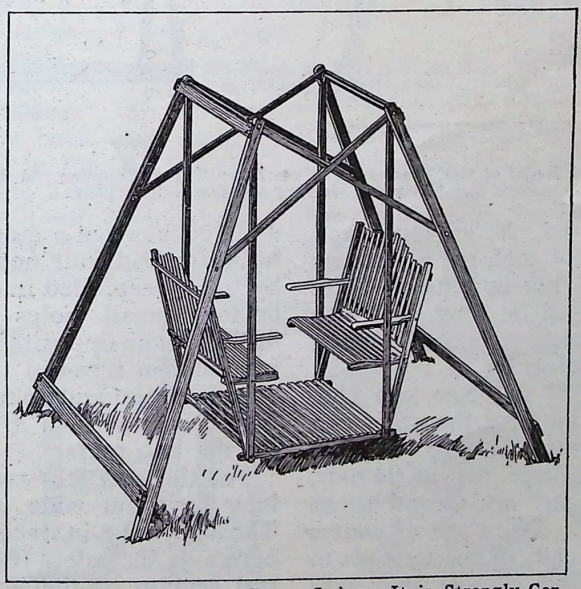


Economical Homemade Lawn Swing

By M. K. HALL

IT is not so difficult to forget the heat of the long summer evenings if one possesses a lawn swing. The average lawn may contain a settee, but the many times more comfortable and restful swing is missing, not because it is not desired, but on account of the cost of the latter when purchased ready-made. If one is handy with a saw, hammer, brace and bit, the cost of a lawn swing will be only that of the lumber.

A general plan of the swing about to be described is shown in Figs. 1 and 2. The supporting framework will receive the first consideration. Cut four boards, 120 in. long, 3½ or 4 in. wide, and 1 in. thick. Lay two of these on a flat surface, such as the workshop floor, with the 1-in. face upward. A top cross board, of the same material but 40 in. long, serves to hold two ends of these supports the proper distance apart. In like manner the bottom cross board, 65 in. long, holds apart the two other ends. These boards are fastened to the 10-ft. supports with screws. To add strength and rigidity to the framework further braces must be used. The frame braces designated in Fig. 2 are 45 in. long, and 2½ in. wide by 2½ in. thick. The lower end of the brace is bolted to the bottom cross board 7 in. from the support. The upper end, which has been previously shaped to join the support, is bolted to the latter. It is suggested that ¼-in. bolts be used with iron washers to protect the wood next to the nut and the bolt head. Two end frames, such as shown in Fig. 2, are required.



View of the Assembled Lawn Swing: It is Strongly Constructed and can be Made by Anyone of Fair Mechanical Ability at No Other Cost than That of the Material

After the end frames are constructed they are assembled as shown in Fig. 1. Four cross braces are required, 60 in. long, and 3½ in. wide by 1 in. thick. Two of these braces are crossed and bolted on each side near the top of the two end frames, holding the latter apart. The braces should be so placed that the spread of the framework at the bottom is about 92 in. and 40 in. at the top.

The general swing assembly is shown in Fig. 3, but the parts entering into its construction will be taken up

in detail. For the hangers four boards, 90 in. long, 3½ in. wide, and ¾ in. thick, are needed. Cut six lengths of ⅜-in. the other end. At the narrow end and through the ¾-in. face, a ⅜-in. hole is bored. A piece of angle iron, 1 by 1 by

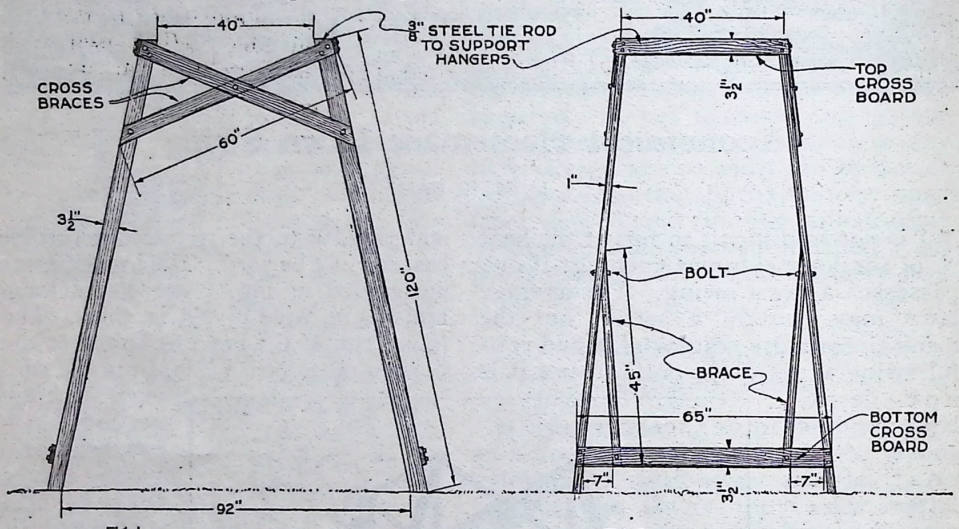


Fig. 1 Fig. 2

Dimensioned Detail of the Framework of the Lawn Swing, Showing the End Frames and the Manner of Bracing and Connecting Them

diameter steel rod, 36 in. long, and thread the ends of each for a distance of about ¾ in. Six lengths of ½-in. black iron pipe, 33 in. long, will also be required. Holes, ⅜ in. in diameter, are bored in the center of the 3½-in. face, 1 in. and 17 in. from one end, and another 10 in. from the other end of each 90-in. board. Using the pipes as spacers and the steel rods as tie rods, two of the hangers are assembled as shown in Fig. 4. Nuts are of course screwed on the ends of the tie rods to hold them in place. Hanger hooks are bolted to the top of each hanger. These hooks are made of a piece of strap iron, 10 by 1 by ⅛ in., and are formed as shown in Fig. 4. When the entire swing is ready for assembly these hooks will hang over a ⅜-in. steel rod fastened at the top and between the end-frame supports shown in Fig. 2.

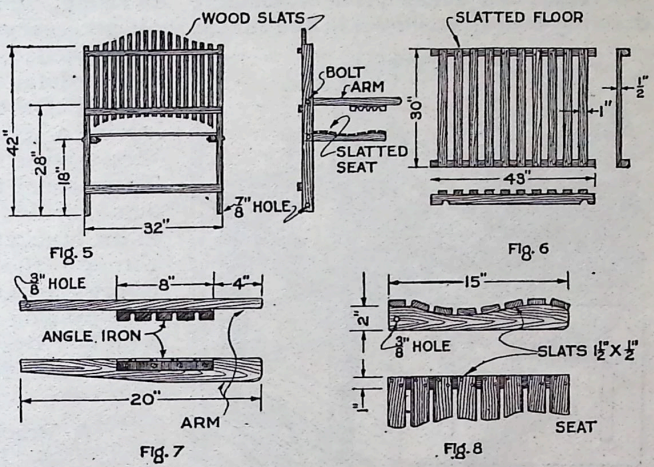
The arms for the swing seat are made from pieces of wood, 20 by 2 by ¾ or 1 in. All corners are rounded, and each piece is formed so that the 2-in. dimension at one end extends for only about 10 in., then tapers to 1 in. at 8 in., is cut from a stock length with a hacksaw, and four notches, ¼ in. wide by ½ in. deep, filed in one side. Three or four small holes for screws are drilled in the opposite side. The angle iron is then screwed to the arm about 4 in. from the wide end, as indicated in Fig. 7. Four such arms are required for the two seats.

For the seat, cut two boards, 15 in. long by 2 in. wide, and 1 in. thick. Through the 2-in. face and at one end, bore a ⅜-in. hole. If desired, the central section of the board may be reduced to 1½ in., as shown in Fig. 8, as this curved surface will make a much more comfortable seat. Eight slats, 30 by 1½ by ½ in., are secured and their ends fastened to the seat boards with screws. Thus a seat 30 by 15 in. in size is constructed. Two such seats are made.

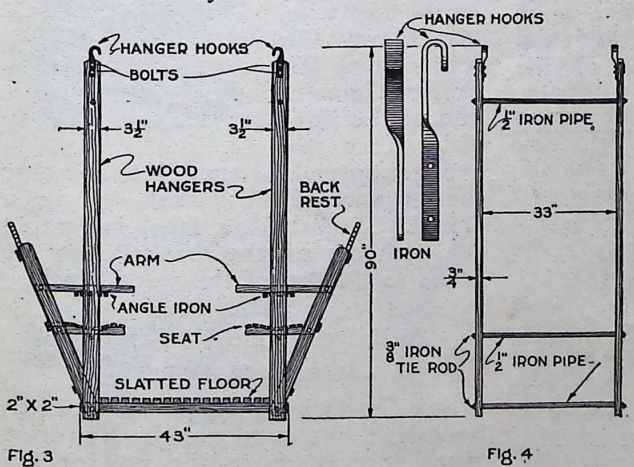
Two back rests are required, and for each the framework consists of two boards, 42 by 2 by 1 in., and three pieces 32 by 2 by 1 in. The shorter boards are used for crosspieces and are fastened in place with screws in the position shown in Fig. 5. Fifteen slats,

18 by ¾ by ½ in., are nailed to the two upper crosspieces. If they are placed as shown in the sketch, the result will be more pleasing to the eye than if their ends lie along a straight line. In each 42-in. board two ⅜-in. holes are bored, one 18 in. and the other 28 in. from the bottom end. One inch from the bottom of the same board a ⅞-in. hole is bored. When the swing is assembled, the ½-in. pipe used as a spacer at the lower part of the hanger, will pass through this hole, serving as a support for the back rest, as in Fig. 3. The arms and seats are then bolted to the back rests in the positions indicated in Fig. 5. For this purpose ⅜-in. bolts are used. Turning to Fig. 3 again, it will be noted that the seat rests on one of the hanger tie rods. If a heavy screw is driven into each of the hangers so that the notches in the angle irons on the arms will engage with them, the angle of incline of the back rests may be changed.

The last part to be constructed is the floor board. Two boards, 43 by 2 by 2 in., are cut, and near the ends of each a notch, 1 in. wide and 1 in. deep, is made. The slats are 30 by 1 by ½ in., and about 20 will be needed. These slats are nailed to the longer boards so that a floor board, similar to that shown in Fig. 6, is the result. The notches will fit over the lower iron-pipe spacers on the hangers, as in Fig. 3. The swing is now ready for assembly with the frame support. A ⅜-in. tie rod is placed at the top of the frame, running between the end-frame supports, as may be seen in Fig. 2. This tie rod on each end frame serves as the support over which the hanger hooks are hung. When the swing has been hung, care must be exercised to see that the frame rests on even ground, otherwise the former will be unbalanced. A little grease applied to the bearing surfaces will help eliminate the friction as well as the squeaks. If possible, the entire swing should be made from some hard wood such as oak. After completion several coats of paint should be applied.



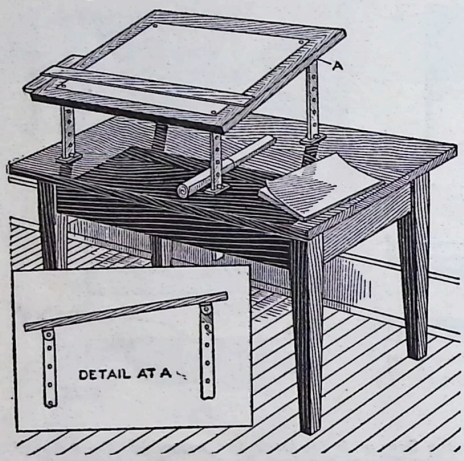
Details of the Floor, the Seat with Its Back and Arms, and the Arrangement by Which the Tilt of the Seat Back may be Adjusted



The Hangers of the Swing and the Hooks for Their Suspension in Detail, Together with a View of the Assembled Hangers, Seats, and Floor

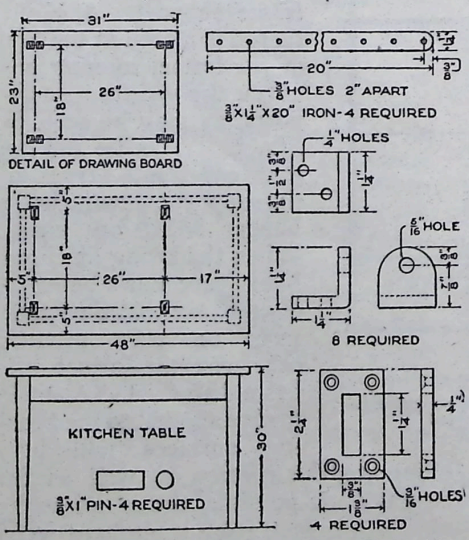
Adjustable Drawing Board Built as a Table Attachment

A neat and inexpensive adjustable drawing board, as shown in the sketch



The Adjustable Drawing Board Mounted on the Table, with Detail Showing the Manner in Which the Supporting Bars are Bolted to the Brackets on the Board

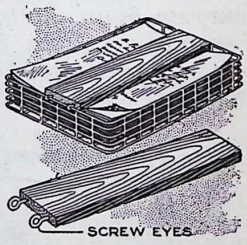
of the completed article, can be easily constructed in connection with a kitchen table. The drawing board used in this case was bought from a manufacturer, since it is difficult for the home mechanic to make a good one. Four slots are cut in the table top for the adjustable supports of the drawing board, and iron plates are fastened with countersunk wood screws, over the slots, as shown in the detail drawing, which gives dimensions and all necessary particulars of the various parts needed. Four pairs of iron brackets, as detailed, are screwed to the underside of the drawing board as shown, leaving a ⅜-in. space between the members of each pair for the supports. These consist of iron bars, which, after being drilled as indicated, are bolted to the brackets on the board and passed through the slots in the table top, where they are adjusted for height and held by iron pins, as shown in the assembly drawing.—Frank Harazim, New York, N. Y.



Full Details and Dimensions of All Parts Needed in the Construction of the Adjustable Drawing Board, Indicating Also the Locations of the Fittings

A Practical Paper Weight for the Filing Basket

A light strip of wood, 1 in. wide by ¼ in. thick, hinged to the side of the office filing basket by two small screw eyes, as shown, will keep the contents of the basket in order, no matter how hard the wind may blow. The screw eyes are first set in the end of the wood strip, then the eyes are opened far enough to slip over the top wire of the basket, and again closed. If desired, a label indicating the contents of the basket may be glued to the top of the wood block.

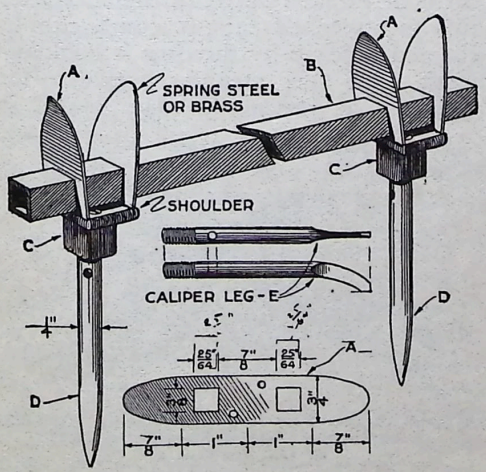


To Drive a Thin Nail or Brad into Hard Wood

Small nails, brads, or pins must often be driven into hard wood. To drive them straight, force the nail or pin through the long way of a cork. Drive as far as possible. Then remove about ⅛ in. from the end of the cork. When the nail head has sunk to the level of the cork, cut off again, until the nail has been driven home.—W. H. Raynor, Springfield, Ohio.

Beam Trammel and Caliper with Positive Grip

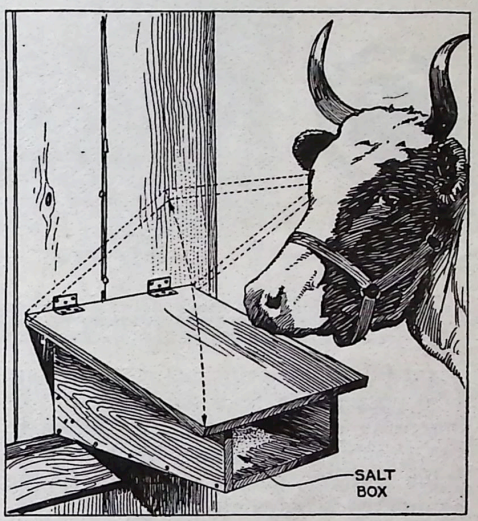
In making a combination trammel and caliper a piece of brass tubing, ⅜ in. square, is preferable for the beam B. Quick-acting and positive-gripping clips, A, are provided by cutting and bending spring steel or brass in the manner indicated. Small holes in the middle of the plates are used in riveting them to the heads C. The latter are made of brass or steel, and drilled and tapped. They are filed on top so that shoulders are formed on each side of the spring plates. The points D are made of ¼-in. cold-rolled steel and threaded to fit the heads. A small hole is drilled through the upper part of each of the members to facilitate turning. The legs E are shaped as shown. By reversing the spring heads the legs may be used either as inside or outside beam calipers. In operation, the spring is compressed with the thumb and forefinger and the head slipped along the beam to the desired point. As the pressure is released, the spring instantly grips the bar and will not slip while in use. When buffed and nickeled, the tool is one that any mechanic may be glad to own. Several beams may be provided if desired, of whatever lengths are found useful.—John J. Eyre, Allston, Mass.



When Properly Made, the Instrument Is an Excellent Trammel and Caliper for Draftsman, Pattern Maker, or Mechanic

Weatherproof Salt Box for Cattle

Cattle learn quickly how to get salt from this device. The box is made open



The Cover of This Salt Box for Cattle Automatically Closes after Use, Protecting the Salt from Rain

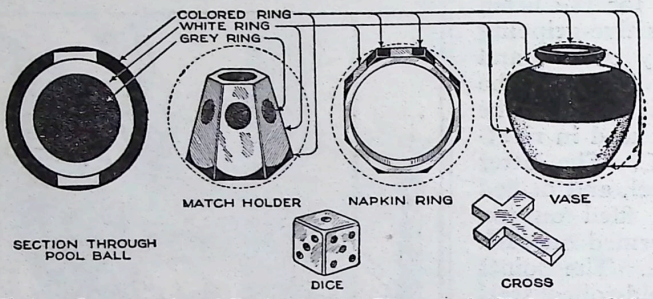
at the outer end, and has a hinged lid, projecting about 2 in. at the sides and end of the box, making it easy for the animals to get at the salt. Make the box strong and rainproof, and place it about 30 in. from the ground. This prevents young cattle from running under the box, or old ones from crowding against it. Convenient dimensions for the box are 2 ft. long and about 1 ft. wide.—Herbert A. Shearer, Chicago, Ill.

Coal Gas as a Substitute for Kindling

The high cost of charcoal and old packing boxes led me to use fuel gas for starting coal fires. A piece of rubber hose was led from a convenient gas jet. A short piece of gas pipe was inserted in the grates through the ash pan, as a torch. In the early morning the torch was lighted, and I could go back to bed, if I wished, assured that in a short time I would have a good, new coal fire in the stove.—Loyal F. Garris, Jackson, Mich.

Novel Articles Carved from Pool Balls

Old pool balls, available for a few cents each, may be made into really beautiful and useful articles by one who possesses a reasonable amount of ingenuity and patience. As shown in the drawing, the balls are built in solid-color sections, so the markings in the completed articles closely resemble inlay. The material is easily worked with hacksaw, drill, and file, and when properly finished takes a high polish. Held firmly in a bench vise, a ball may be sawed or drilled without difficulty. The finishing work is done with files and sandpaper, and a buffing wheel is used for the polishing.—George L. Furse, St. Louis, Mo.



Various Ornamental and Useful Articles That may be Made from Old Pool Balls: The Drawing Also Shows the Layer Construction of a Ball, Which Makes Possible These Artistic Designs

Method of Locating Breaks in Insulated Wires

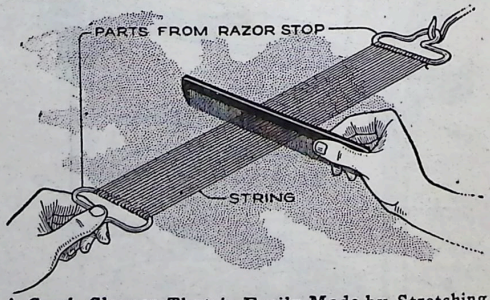
A broken circuit in a piece of insulated wire may be readily located by the use of a test line made from a yard of bell wire and two pins. The two pins are connected by means of the piece of bell wire. Holding a pin in each hand, they are held apart the length of the wire while the points are pushed through the insulation of the broken line. This action is repeated along the circuit until the two pins and the bell wire form a contact by straddling the break. This method, while satisfactory for low-voltage currents, would be dangerous for use on high-voltage wires.—Peter J. M. Clute, Schenectady, N. Y.

Handy Steam Box Made for Bent-Wood Work

A handy steaming box for bending wood was rigged up from odds and ends. The body was made from several lengths of stovepipe. The ends were made of wooden plugs—one the inside diameter of the pipe, and the other slightly larger. The two were nailed together, and the smaller plug inserted in the pipe. A hole was cut in one of the plugs, through which a piece of ¾-in. rubber hose was passed. An old teakettle on a gas jet furnished steam, through the rubber hose. Such a steamer can be changed in length by adding more sections of stovepipe, and can handle anything from a sled runner to a pair of skis.—Harlie Garver, Hastings, Neb.

Comb Cleaner for Home or Barber Shop

A device which simplifies the cleaning of combs is made by taking the looped metal ends of an old razor strop and stretching a number of strong cords or threads between them. When this is stretched taut a comb can be cleaned quickly by moving it back and forth with the strands between the teeth. The device is also useful in cleaning brushes.—Robert C. Knox, Arcadia, Fla.



A Comb Cleaner That is Easily Made by Stretching Cords between Metal Ends Taken from an Old Razor Strop

A Hawaiian Grass House

and How to Make It

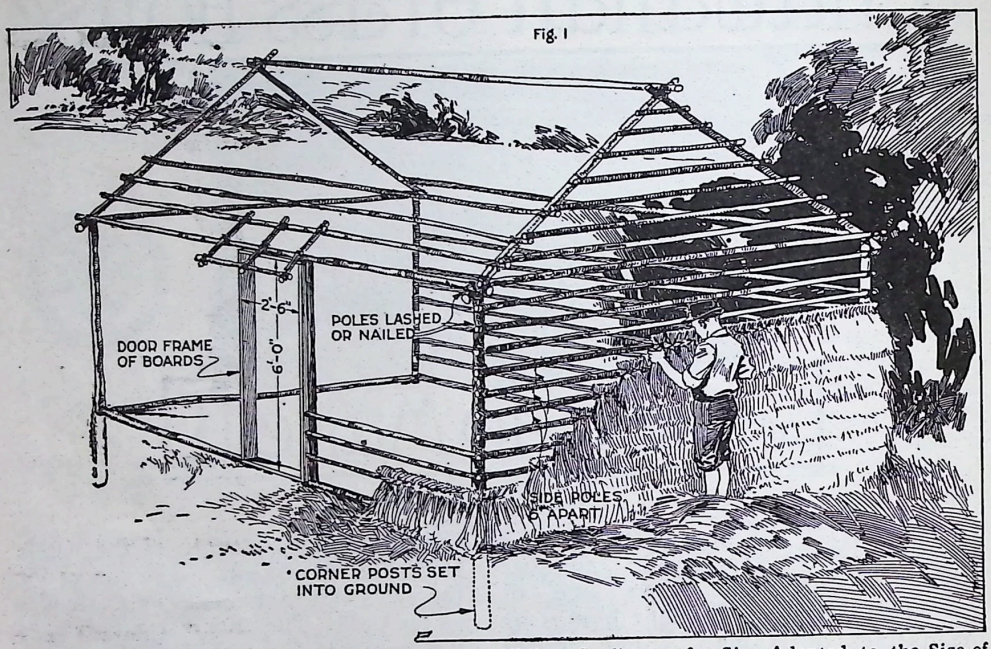
By HARRY MARCELLE

PROBABLY no more attractive or thoroughly serviceable summer house is obtainable than one of the type used as permanent homes by the natives of Hawaii. Such houses may be built from a great many varieties of grass. Bamboo leaves are used successfully in the East Indies, rice straw is used in Japan, while in the United States cat-tail, or other forms of long marsh grass, or ordinary timothy, will accomplish practically the same results.

Only a few of the simplest tools are needed for the building of such a house. The frame is best made from willows, but of course any other kind of slender saplings obtainable is satisfactory. Willows are usually found in low marshy ground and, therefore, near abundant supplies of marsh grass or cat-tails. The size of the boughs to be used for the frame will, of course, have to be determined by the size of the house.

These houses are generally built 8 ft. wide, and about 12 ft. in length. The side walls should be high enough to provide ample headroom inside, while the roof is given a pitch similar to that indicated in Fig. 1. Windows are seldom used, but may be provided if desired. Sufficient light is usually obtainable through the dried grass. The corner posts should be quite heavy and set securely in the ground, for upon these the strength of the whole structure will depend. The pieces for the sides and roof should be as slender as possible. The entire framework, as illustrated in Fig. 1, is lashed together with binder twine, a roll of which may be obtained at any farm-supply store, or nailed if the builder desires. It is even better to have the structure both nailed and tied. If possible, the door frame should be made of boards, as indicated. After setting the four corner poles and connecting them up with the roof-frame members, the door frame is installed. The limbs forming the framework of the walls and roof are then placed. These should be about 6 in. apart, and the work is begun at the bottom. After the projection, as indicated in Fig. 1, has been installed over the doorway to support the overhanging grass, the thatching becomes the next stage of construction.

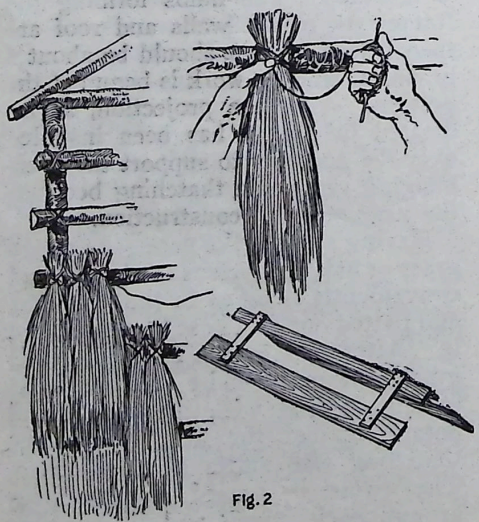
Having secured the necessary marsh grass or hay, as much as can be grasped conveniently is taken in the left hand, and patted out on a board to straighten it. After this is accomplished, it is grasped near the end of the bunch, as in Fig. 2, and with the other hand bound against the first limb. The thatching also starts at the bottom. The twine is passed several times around each bunch and its support, after which it is cut off and tied. The same process is continued until the



The Frame of the Grass House is Preferably Made of Willow Saplings, of a Size Adapted to the Size of the House. For the Covering Marsh Grass, or Even Ordinary Timothy, may be Used

whole house has been covered. The bunches should be placed as near each other as possible and the ends permitted to overlap by at least half their length. If careful attention is not paid to this point, the house will not be thoroughly rain-proof.

When the thatching is completed, a rough frame, as illustrated in Fig. 2, is made and placed on the ridge of the roof. This serves to hold the last layer of grass in place. The building of such a house presents no serious difficulties, and it may be made to serve a great many practical purposes. As a summer sleeping house, or lawn shelter, it is excellent, and will offer a perfect protection even in a heavy shower. It should be remembered, however, that the construction of this house makes it an object which should be guarded against fire, and that no chances should be taken with possible accidental ignition.



The Bundles of Grass are Tied to the Frame Members as Shown, Overlapping at Least Half of Their Length. A Detail of the Ridge Frame is Also Given

Penholder Attachment for the Ordinary Ink Bottle

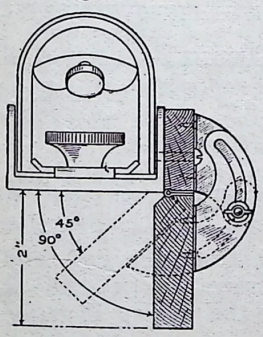
To avoid smearing up the desk with a rolling penholder, a piece of light copper wire was twisted around the neck of the ink bottle. This formed a loop in which the pen and holder were inserted. Thus, when not in use, the penholder was in a vertical position, always easy to find.—W. H. Thomas, Davenport, Ia.

Method of Using Pack Films in a Plate Camera

I devised a satisfactory way of using film packs in my dry-plate holders, as follows: An old glass plate was fitted into each holder of the plate camera, with a piece of black paper on the front, the same size of the glass plate. This eliminated any chance of damage to the photographic qualities of the film. A film exposure to each glass plate was secured by snapping small rubber bands round both film and plate at the extreme ends.—H. K. Capps, Stahl, Mo.

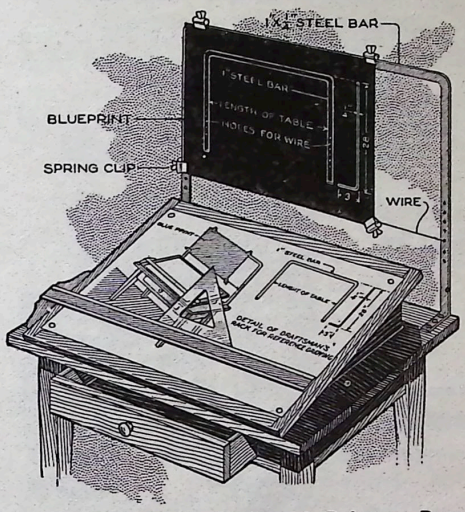
Serviceable Gauge for Block Plane

In making a gauge for a block plane, two pieces of hard wood are hinged with 1½-in. brass butts after the inner top edge of the bottom member has been given a 45° bevel. The upper block is fastened to one side of the tool by screwing ¼-in. stove bolts into threaded holes. Semicircular adjusting plates are cut from heavy sheet iron or brass, the curve having for its center the hinge joint. They are slotted as shown, bent at right angles, and screwed solidly to the blocks in such a position that they may be held firmly together with a bolt and wing nut. The gauge will embrace all angles from 45° to 90° and may be set by applying a try-square, draftsman's triangle, or a bevel protractor.



Draftsman's Rack for Reference Drawings

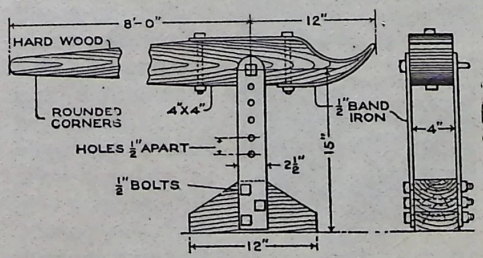
By bending a 1 by ½-in. steel bar in the manner depicted, and mounting it at the rear of a table, a convenient rack for reference drawings is provided the draftsman in crowded quarters. Such an arrangement takes the place of a reference desk where there is no available room for one beside the drawing board.—J. J. O'Brien, Buffalo, N. Y.



This Rack Keeps the Draftsman's Reference Drawings in Plain View and Out of the Way

Handy Quick-Action Jack for the Motor Car

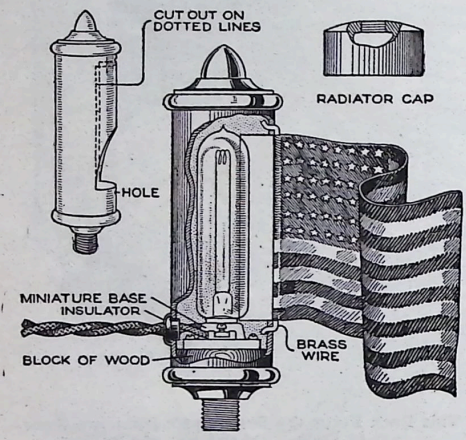
For garage work a satisfactory quick-acting jack may be made as shown. For the lever a 9-ft. piece of 4 by 4-in. hard wood, shaped as shown and bound at the weight end with ½-in. band iron, is used. The standard is built with a 4 by 12-in. base. Iron uprights, 2½ in. wide, are secured by three bolts and provided with holes, ½ in. apart, to permit adjustments. Fifteen inches should be the distance from the bottom of the base to the center line of the fulcrum when the lever is held in the top hole.



This Automobile Jack Gives Quick Action and Is Adjustable. Eight-Foot Leverage Supplies Great Power

Radiator-Cap Flag Holder Made from Old Whistle

An old whistle, 1 in. or 1½ in. in diameter, such as can be obtained from



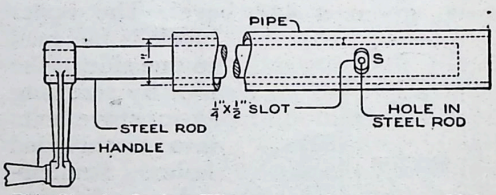
Flag-Holder and Illuminator, Made from an Old Whistle, and Used as Auto-Radiator Emblem

a secondhand dealer, can be made into a very effective flag holder for an auto-radiator cap. A slot, 1 in. wide, is cut the length of the whistle, and after removing its top, a block of wood, on which a small light socket has been mounted, is fitted snugly into the lower end. A hole of the proper size is drilled and tapped in the radiator cap, into which the whistle is screwed. Electric wires are connected with the socket through a ⅜-in. hole drilled opposite the slot and provided with a rubber insulator. A stiff wire, with ends bent to serve as hinges, is inserted into holes drilled above and below the main opening. To this wire a silk flag is attached, a hem being made in the flag through which the wire passes. A tubular bulb is then inserted in the socket, and the wires are connected with the lighting system by means of a plug. The latter is necessary in order that the cap may be removed for filling the radiator. Care should be taken to have the slot in the whistle face the rear so as to light the flag when the car is in motion. —Harry Marshall, San Francisco, Calif.

Spiral-Spring Winder Made from Pipe and Rod

Coil springs can be made inexpensively and quickly with the winder shown in the illustration. It consists of an iron-pipe outer cylinder and an inner rod, and it is made as follows:

In a piece of pipe, about 2 ft. long and with an inside diameter equal to the outside diameter of the spring desired, cut a slot, as shown at S. It should be about ¼ in. wide by ½ in. long, and cut through only one side of the pipe, about 8 in. from the end. In a steel rod, about 2½ ft. long and having an outside diameter equal to the



This Simple Spring Winder can be Used to Make Either Open or Closed-Coil Spiral Springs

inside diameter of the spring, a hole is drilled, about 2 in. from the end, and large enough to receive the end of the wire of which the spring is to be made.

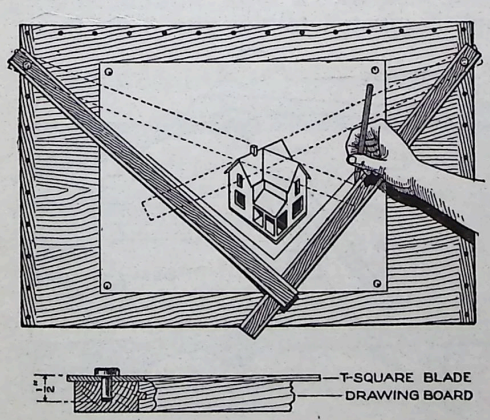
On the other end of the rod a crank is attached, or in an emergency a pipe wrench can be used. To wind the spring, insert the rod in the pipe. Bring the hole in the rod opposite to the slot in the pipe, and insert the wire. By turning the rod either to the right or to the left, a right-hand or a left-hand spring may, as desired, be made. If open or compression springs are to be wound, the slot in the pipe should be cut sufficiently wide to permit a spacer to be inserted between the turns of the spring, thereby providing any width of opening between turns that may be desired.—J. E. Hester, Anderson, Ind.

Used Carbon Paper Renewed by Heating

Used carbon or transfer paper can be made to last much longer by simply holding it over an open flame such as a lamp, candle, or match, with the carbon side down. The wax substance of the unused parts will melt and run into the thinner sections of the used parts.—Edith M. Thayer, Jackson, Michigan.

An Arrangement for Plotting Perspective Drawings

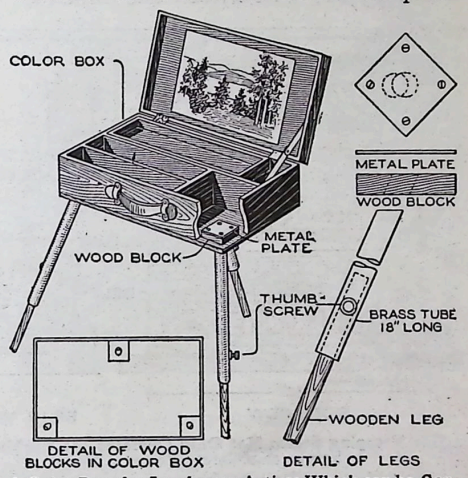
The device detailed in the accompanying illustration will save time when perspective drawings are to be plotted. How it is used is obvious from the picture. A series of ¼-in. diameter, equidistantly spaced holes, to accommodate hard-wood pegs, are drilled ½ in. deep around three sides of the drawing board. Two T-square blades are used. Each pivots on one of the hard-wood pegs inserted in a hole. The two holes used for these pegs in rendering a certain drawing should be in the same horizontal line which represents the "horizon" line of the drawing. It is desirable to glue the pegs to the blades to insure a firm connection. The holes do not interfere with the regular use of the drawing board.—R. J. Stephens, Kansas City, Mo.



The Drawing Board is Provided with Holes in Which T-Square Blades are Pivoted by Removable Pegs to Facilitate Plotting of Perspective Drawings

Simple Easel for Landscape Artists

A landscape artist who uses a wooden color box has devised a practical means of converting it into a sketching stand or easel. Three legs were made, each consisting of a piece of brass tubing 18 in. long, into which a wooden rod was fitted so that it could slide up and down. In the side of each tube a hole was drilled, over which a nut was soldered, and into the nut a thumbscrew was fitted to hold the rod in the desired position. To make sockets for the legs three wooden blocks were glued to what serves as the bottom of the box when it is open, and capped with metal plates, each hole slanting so that the legs would spread apart sufficiently. When sketching is to be done, the legs are fitted into the sockets and adjusted. When the box is to be carried the legs are removed, telescoped, and tied into a small bundle.—L. B. Robbins, Harwich, Mass.

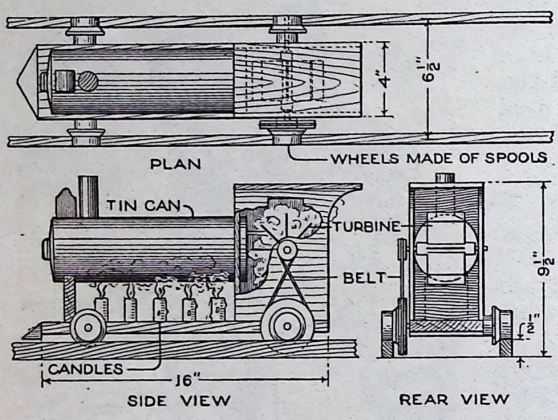


A Color Box for Landscape Artists Which can be Converted into an Easel by Inserting the Extensible Legs into Sockets Located in the Side of the Case

Toy Locomotive is Run by Steam Turbine

Grown-ups as well as members of the younger generation will find amusement in the turbine-driven locomotive illustrated, which, if provided with a circular track, will run for an

hour or more without attention. The boiler is a cylindrical can that holds about a quart of water and is held in a horizontal position by two supports at either end. The wheels are the ends



The Escaping Steam Not Only Operates the Turbine but Serves as a Safety Valve as Well

of spools, and the bed piece, which holds the wheel shafts, is made from a 1-in. pine board, 16 in. long and 4 in. wide.

In the end of the boiler which protrudes into the engineer's cab, a hole is punched with a 10-penny nail, about 2 in. above the center. Candles, or a small alcohol lamp, placed under the boiler, cause the water to boil. The steam rushes out of the hole in the end, strikes against the paddles of the turbine and causes it to revolve.

The turbine is made by nailing eight pieces of tin, 3 in. long and 2 in. wide, upon a wooden axle which is mounted on two upright posts fastened on the bed piece of the locomotive. The turbine should be located just the right height so the steam will strike each paddle about in the center when in a vertical position. On the turbine shaft a 1-in. pulley, cut from a spool, is fitted, and in line with this a 3-in. driving pulley is fitted to one of the rear wheels. The belt from the turbine drive shaft to the wheel should be twisted in order that the locomotive should run ahead. The track is constructed from pine sticks ½ in. in thickness.—F. E. Brimmer, Dalton, New York.

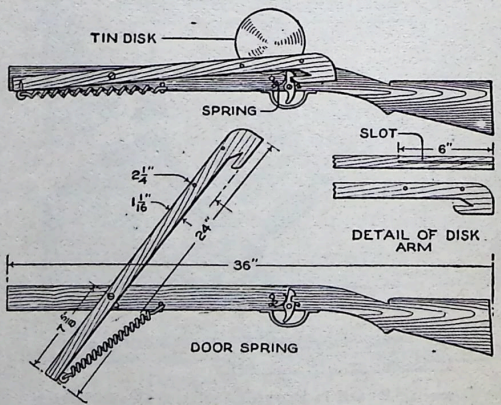
Kerosene Fire Lighters and Fire Logs

Fires can be started with clinkers or ashes. Soak pieces about the size of a large duck egg, cold, in kerosene oil. With a good draft little or no kindling is needed for either coal or wood.

Oil fire logs are also economical of time and fuel. They are made by spreading out a half dozen newspapers, and rolling them up one by one with the folded edges inside, continuing to add paper until a roll of about 3 in. is made. The edges and ends are then pasted together, and the logs cut into 4-in. lengths, which are soaked in kerosene for a moment. One "log" will start a coal fire. Two will burn alone, giving heat for an hour or two.—Mrs. C. W. King, Arkona, Ont., Canada.

Disk-Shooting Gun Provides Economical Target Practice

A gun which shoots tin disks is easily made from a thick pine board, 36 in. long, and is the source of much inexpensive amusement. The disk arm, 24 in. long with a 10-in. slot cut in one end, is pivoted to the gun 8 in. from



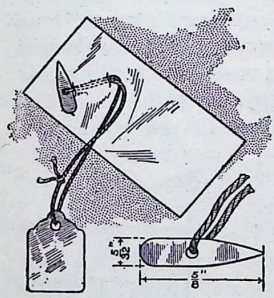
This Disk-Shooting Gun can be Used Purely as an Amusement Device or to Discharge Targets Similar to Clay Pigeons

the muzzle. A screen-door spring supplies the necessary power. The

wooden trigger, 3 in. long, is whittled out and pivoted at one side, with a curved spring to actuate it, and an old door handle is placed beneath it as a guard. The ammunition can be cut from old tin or bought in the form of kettle covers. To hold the disk properly in the disk arm, two pins should be inserted, as shown. The gun can be fired from the shoulder or when lying on its side. In the latter case the disks sail like clay pigeons.

Bodkin String Tags Convenient for Fastening

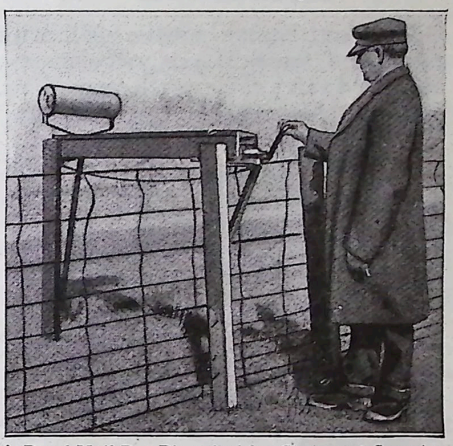
For convenience in attaching to cards of buttons, cheeses, and similar articles that do not afford any available place for tying the string, tags having small steel bodkins are useful. With them much time is saved in the marking of goods. The bodkins are inexpensive, but if desired may be instantly removed from the goods when sold.—Harry L. Dixson, Northfield, Minn.



This Country Mail Box Goes to Rural Carrier

To save steps in going to the mail box, one farmer rigged his mail box to travel from the roadside over the fence and in easy reach, without requiring anyone to leave the yard. The picture shows a cylindrical mail box ready for the mail man. When he has left the mail, the farmer turns the crank, and a sprocket and chain pull the box to him.

This arrangement was worked up in the farm tool shop, and could probably be duplicated from the extra repairs and broken machines on any farm. A cleat at the outer end stops the box from running off the boards that support it. The mail box is bolted to two iron straps, which fasten to a chain. The handle and sprocket draw

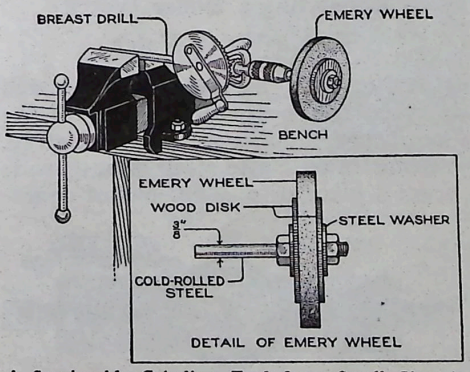


A Rural Mail Box Rigged with a Chain and Sprocket Device So That the Farmer can Pull It to Him without Leaving His Yard

the mail box out, and drive it to the road.—H. V. Stanley, Chicago, Ill.

Breast Drill Converted for Use as a Grinding Tool

Amateur mechanics whose shops are provided with a vise and breast drill may have a serviceable grinding tool by forming the simple combination illustrated. A small emery wheel is mounted as shown in the detail sketch, and is set in the chuck of the breast drill, after the handle has been clamped in the vise as indicated. The action of

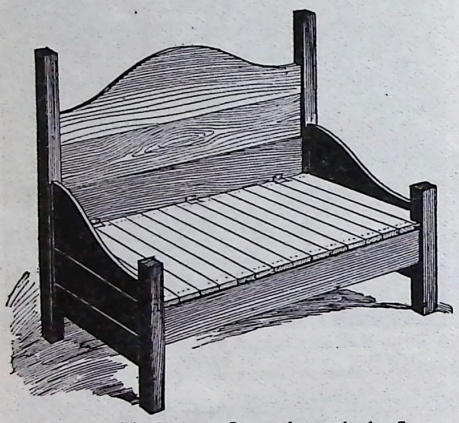


A Serviceable Grinding Tool for a Small Shop is Obtained by Clamping the Handle of a Small Breast Drill in a Vise and Mounting an Emery Wheel in the Chuck

the breast drill is thus utilized for rotating the emery wheel.—C. C. Spreen, Flint, Mich.

A Simple Porch Settee Made from Bedstead

A person having a little skill with carpenters' tools can easily construct a novel and serviceable porch settee from

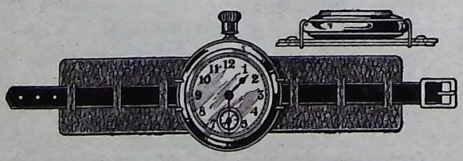


A Settee, with Storage Space beneath the Seat, Made from an Old Bedstead

an old wooden bedstead. The foot piece is sawed in half vertically and the two parts are then screwed to the headpiece, thus forming the back and sides of the seat. A bottom is then boxed in and supplied with a cover, hinged to the back. Beneath the cover, books and magazines can be stored. The seat can be upholstered or provided with sofa cushions.

Converting a Dollar Watch into a Wrist Watch

A thoroughly serviceable wrist watch may be had by mounting any of the small type of dollar watches on a strap, as illustrated. The strap is best made from a piece of pigskin, but of course

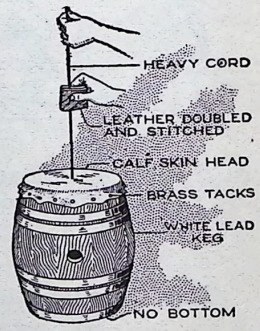


A Dollar Watch, a Scrap of Pigskin, and a Ten-Cent Buckle, Enter into the Combination of This Serviceable Wrist Watch

russet, calf, or any other good grade of leather, will do. If the back of the watch is tight, the strap loops may be soldered to it. But on many cheap timepieces it will be found that the back fits so loosely that it will be in danger of pulling off. Such watches should be fastened as indicated. Two small holes are drilled in the outside rim of the case and into these the wire fastenings are clinched and soldered. A bit of luminous paint may be purchased, and with a fine camel's-hair brush it is an easy task to touch up the hands and lettering of the dial to equip the watch for night use.—W. C. Naylor, Lapeer, Mich.

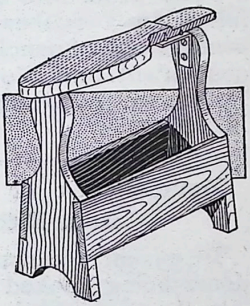
Reproducing the Roar of a Lion

For entertainments or "stunts" calling for the reproduction of a lion's roar, the desired effect can be realistically produced by equipping a 25-lb. white-lead barrel as follows. A calfskin, such as is used for drumheads, is dampened and stretched over one end of the keg, from which both heads have been removed, and fastened with tacks. When the skin has dried, pierce its center, and, to prevent enlargement of the hole, paste a small piece of skin, properly perforated, over the hole on each side of the drumhead. A stout cotton cord is passed through the hole and a knot tied in each end. Two pieces of heavy leather, 3 in. square, are rubbed with rosin on the rough side and stitched together, the rosined sides facing each other. The cord is then threaded through this device and held taut. By sliding the leather squares up and down along the cord, applying more or less pressure, a roar is produced, the pitch and volume of which varies with the tightness of the cord.



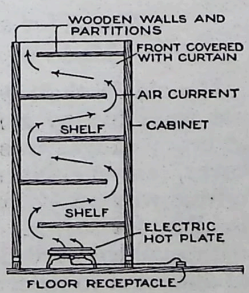
Shoe-Polishing Stand for Home Economy

Funds for the purchase of war-savings stamps would be materially increased if members of households individually and collectively diverted into the home treasury the many dimes and nickels spent each week practically unnoticed in the shoe-shining parlors. Any boy can make a shoe-shining stand, similar to the one illustrated, and it will assist toward saving, and better-looking shoes. The upright end pieces are cut from plain lumber, ¾ in. thick, 4 in. wide, and 12 in. long, and in the shape shown. The top member, or foot rest, is cut from a piece of wood, 1 in. thick, 3 in. wide, and 9 in. long, and is shaped to take the sole of the shoe, as in the sketch. The completed parts are glued and fastened with wood screws. Brushes, rags, and polish are kept in the box formed in the lower part.—R. O. Helwig, Chicago, Ill.



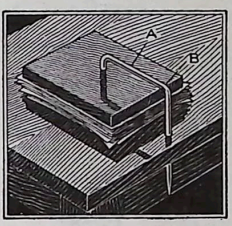
Electric Drier for Small Blueprints

By constructing an open-faced cabinet with shelves arranged in the manner shown in the accompanying drawing, and installing an electric hot plate at the bottom, a serviceable drier is provided for small blueprints and photographic plates. Holes are bored in the sides along the bottom, and the top is left open. The front of the cabinet is curtained.—Terrell Croft, St. Louis, Missouri.



A Letter Press Made from Iron Rod

A very simple letter press can be made by bending a ½-in. iron rod to the shape shown and placing it in a hole in a table slightly smaller in diameter than the rod. Letters to be pressed are placed beneath a piece of thick board and the rod is then thrust down onto the latter. If extra pressure is desired it can be obtained by striking the rod at B with a hammer. To release the letters, pull up on the arm, at A.—Joseph Thalheimer, Jr., Phoenix, Ariz.



Improvised Scraper on Running Board Keeps Auto Clean

To one whose work lies in fields, or along muddy country roads, a scraper on the running board of his car is an aid in keeping the interior of the car clean. It is easily installed, especially on a low-priced car. On a high-priced car the plan might be tabooed, unless the car is old.

An opening is cut in the running board, about 1 ft. long, but not wide enough to weaken the board. Scrapers of strip iron, spaced on about 2-in. centers, remove the mud. About an inch of each end of the scrapers is given a half turn, and the ends are drilled for bolting to the running board with stove bolts. The scraper strips are about 1 in. wide and project ½ in. above the running board.—C. L. Meller, Fargo, N. D.

Auxiliary Notch in Claw Hammer Pulls Tacks

By filing or grinding a notch in one of the claws of an ordinary hammer, provision is made for readily pulling small nails and tacks. The arrangement is particularly convenient when one is working with old lumber in which nails and tacks of all kinds have been driven, for it obviates the bothersome practice of using two tools.—Frederick H. Fordman, Atlanta, Ga.

Field Numbers on Farm Gates for Identification

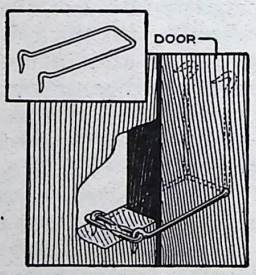
An Illinois farmer has numbered each of the fields on his farm for the purpose of carrying out a plan of crop rotation. Because the farm contains a large acreage, it is necessary to employ from 15 to 20 men during the growing season. The farm-labor shortage has caused keen competition among farmers for the help which is available, and is also the cause of the farm hands constantly changing from one farm to another. New men are unaccustomed to the lay of the farm fields, and consequently unable to accomplish a full day's work. This Illinois farmer has partly solved the problem by placing the field numbers on the entrance gates. A new man, when given instructions to go to a certain field for work, can readily identify that particular field by the number on the gate.

Rubber Checking Stamp Cut in Pencil Eraser

A rubber eraser on a lead pencil can be made into a stamp for checking report and time slips to show that they have had attention. An initial, or private check mark, can be carved with a sharp knife into the eraser tip, and inked on a rubber-stamp pad. The combination of pencil and stamp is very convenient, and allows speedy work—Robert M. Worthington, Minneapolis, Minnesota.

Double Hook for Doors Operated from Either Side

Inconvenience caused by double barn doors being hooked on the side opposite the user can be overcome by installing a double hook made from a stove poker or rod of similar size, bent into a U-shape as shown. Each end should be fashioned into a tapering hook. Part of the bending will of course have to be done after the rod has been inserted in the hole provided for it. Since both hooks move together a door can be latched or unlatched from either side.—Leonard Stubbs, Noblesville, Ind.



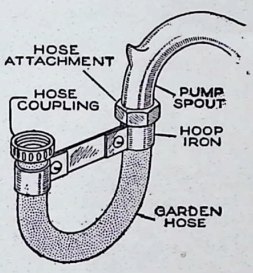
Cover for a Football Made of Canvas

My old football wore out, and I did not want to buy a new one. A piece of heavy canvas was cut, using the old cover, laid out flat, as a pattern. The canvas was cut ¼ in. large on all edges to allow for seams. I sewed the seams with doubled cord, leaving about 5 in. of one seam to insert the bladder. The seams were made with a tight buttonhole stitch. Then the cover was turned so the seams came inside. The open edges were reinforced with strips of leather about 1 in. wide. The leather

was punched with holes, and the ball laced with a shoe string. The canvas-covered ball proved to be very serviceable.—Thomas Peterson, Springfield, Massachusetts.

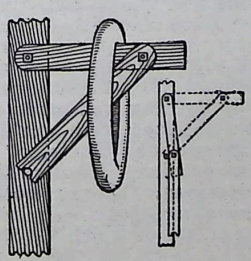
Detachable Drinking Fountain for Iron Pump

A very satisfactory detachable drinking fountain of the bubbling type was made for use on an iron pump from the following pick-ups: An 18-in. piece of garden hose; a hose coupling; a piece of band iron, 1½ in. wide and 12 in. long; two stove bolts, and the hose attachment which came with the pump. The pump-spout hose attachment was inserted in one end of the hose, and the coupling in the other end. The hose was then bent U-shaped, and held in this position by a cross arm, each end of which was bent to form a clamp, as shown. To use the fountain, the pump handle is moved by the right hand until a free flow of water is secured. One or two short strokes will keep the water bubbling while the drinker slakes his thirst.—T. H. Linthicum, Annapolis, Md.



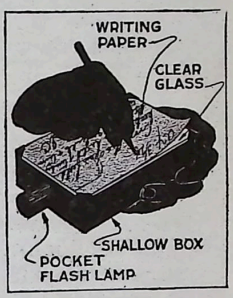
Folding Tire Rack for the Garage

A convenient folding rack on which to hang spare tires in a garage is made of 1 by 4-in., or 1 by 6-in., roof boards, as shown in the accompanying illustration. The arm is bolted to a stud, while the lower end of the brace is notched to fit over a spike or peg driven into the upright.—Walter B. Raynor, Patchogue, N. Y.



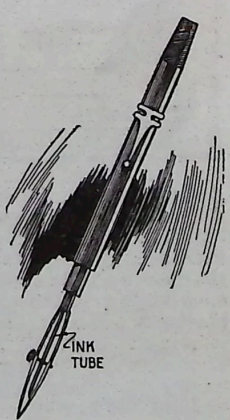
Writing with an Invisible Light

If for military or other reasons it is necessary to write a message in the dark without the use of an ordinary light, an illuminated box with a glass top can be used. The box is made of any suitable material, 4 in. wide, 6 in. long, and deep enough to hold a flash light, the switch for which is allowed to project from one side. By placing writing paper on the glass top and lighting the lamp, the user can write without difficulty. If adequate shelter is not available, the writer can cover his head, arms, and the box with his coat.—P. J. Backus, Delphos, Ohio.

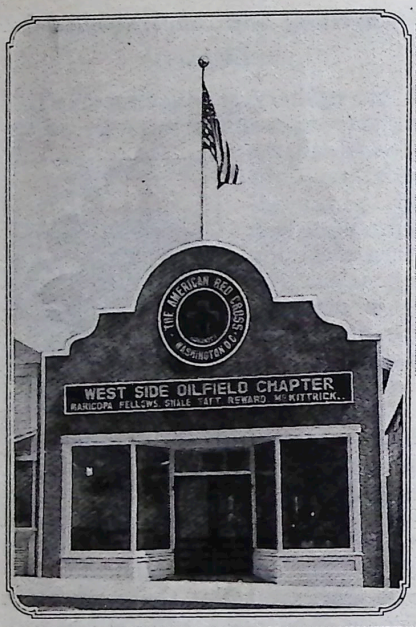


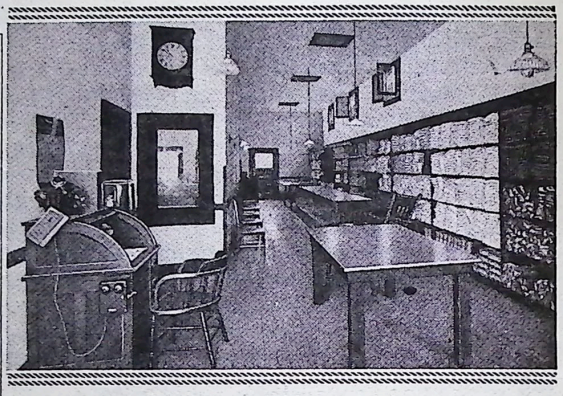
Fountain Ruling Pen

This fountain ruling pen is made from a self-filling fountain pen. By turning the screw at the top of a fountain pen of this type, the ink is sucked into the barrel through a small tube, filling the pen. To eject the ink, the screw is turned in the reverse direction, which forces the liquid out of the tube onto the pen point. By cutting off the lower end of the barrel, threading it, and screwing in a ruling pen, a convenient instrument for the draftsman results. Before the ruling pen is screwed on, a small hole must be bored through its ferrule, through which the ink tube may pass.—Kenneth Bullock, Lapeer, Mich.

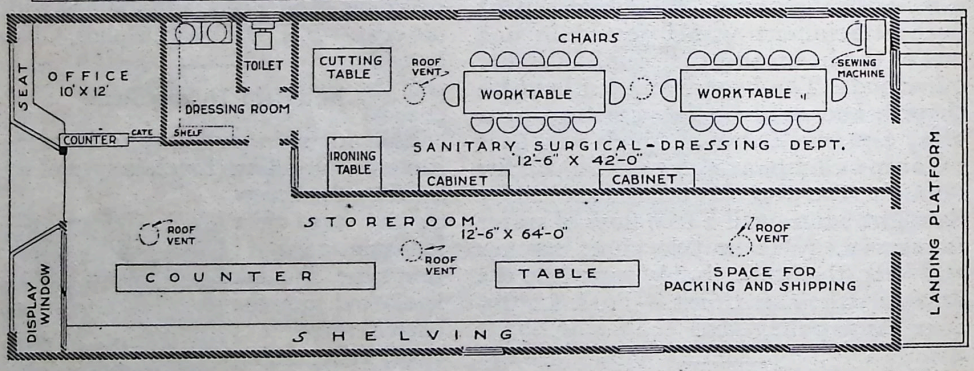


SMALL, WELL-PLANNED BUILDING FOR RED CROSS





The Picture at the Left Gives a Front View of the New Red Cross Building at Taft, California. The Structure was Erected in a Single Day and Now Provides Excellent Accommodations for Local War Workers. An Interior View, Looking Rearward in the Stock Room, is Presented Above. Details of the Arrangement of the Building are Clearly Explained by the Plan Below, Which Shows the Division of the Space and the Location of the Furniture



IN accord with the spirit that animates progressive American communities, Taft, Calif., a small town in the oil and gas belt, recently erected in a single day a commodious Red Cross building. The structure supplies local workers with light, airy quarters of adequate size for their needs. Also it offers an excellent suggestion to other communities, or groups of towns, that lack suitable accommodations for Red Cross work in buildings already erected, as was the case in this instance. The structure is of frame and stucco construction. The interior is plastered and neatly finished throughout, and the space efficiently divided for the use to which it is put. Half of the floor area is utilized for storage, packing, and shipping purposes. The other half has a small office at the front end. Immediately back of it are dressing and toilet rooms. The remainder of the space is partitioned off for the surgical-dressings department and finished in white enamel. The erection of the building was made a gala event in which the whole community participated. At one time 104 men were working without confusion on the structure, which is 25 by 65 ft. in ground dimensions. The start was made early in the morning and work suspended at 5:30 o'clock in the evening. At that time the plumbing was in, the electric lights installed, and the plastering drying. There are other war buildings that have been raised in a day, but this is the first specialized Red Cross building so erected that has come to notice. The cost of the building was $4,000, of which $1,200 was donated.

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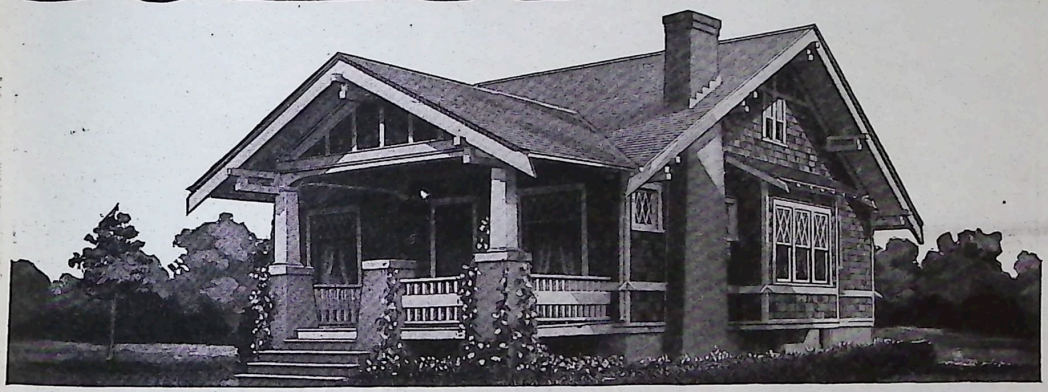

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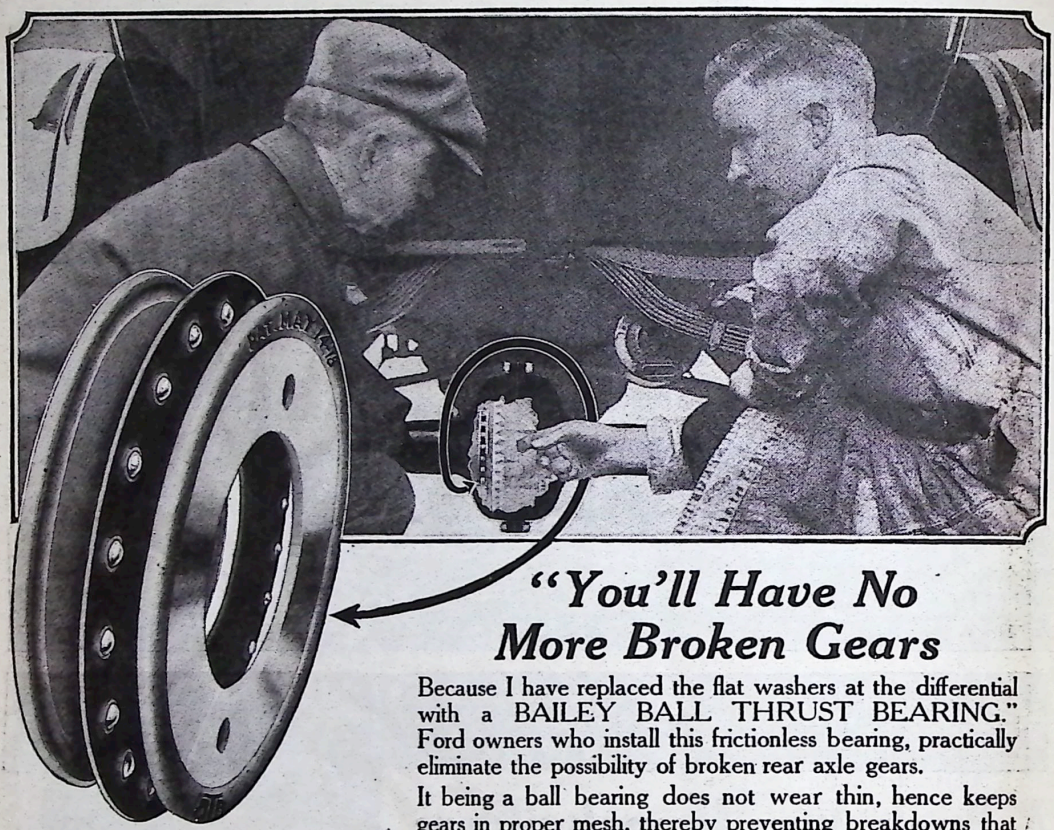


"You'll Have No More Broken Gears

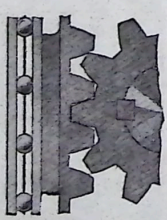
Because I have replaced the flat washers at the differential with a BAILEY BALL THRUST BEARING." Ford owners who install this frictionless bearing, practically eliminate the possibility of broken rear axle gears.

It being a ball bearing does not wear thin, hence keeps gears in proper mesh, thereby preventing breakdowns that may mean your being left helpless in a jammed street, on a railroad crossing or miles from home.

Has eighteen highest grade friction eliminating steel balls, and therefore must effect a big cut in fuel consumption as well as add power.

With Bailey Ball Thrust

Gears are always properly meshed—ball bearing stands up under pressure and holds the gears snug. The drive is exerted firmly on strong part of two teeth instead of on one, no noise, no lost power, no jerky "back-lash" and no stripping or breaking of gears.



With the Ordinary Washer

This shows the gears partly out of mesh because the washers at left side have worn thin due to gear thrust. This results in drive being taken on one tooth only and on weak part of that tooth—resulting in loss of power, noisy gears, jerky "back-lash" and stripping.

For FORDS

and Those Chevrolet 490's Having Thrust Washers

Every Bailey Ball Thrust is fully guaranteed. Is made of finest heat treated materials and has six times greater strength than necessary.

Fleet owners, large and small everywhere, are using Baileys, realizing that this bearing reduces up-keep cost and cars are always in service.

Your dealer will tell you what it will do and that we guarantee it.

He will tell you it is not wise to wait until washers reach the danger point in thinness before you install a Bailey. Get one today. Should he be unable to supply you, write or wire us at once and we will see that you are supplied.

Price, $3.75

Dealers-repairmen:—Practically every jobber in the U. S. and Canada carries this bearing in stock

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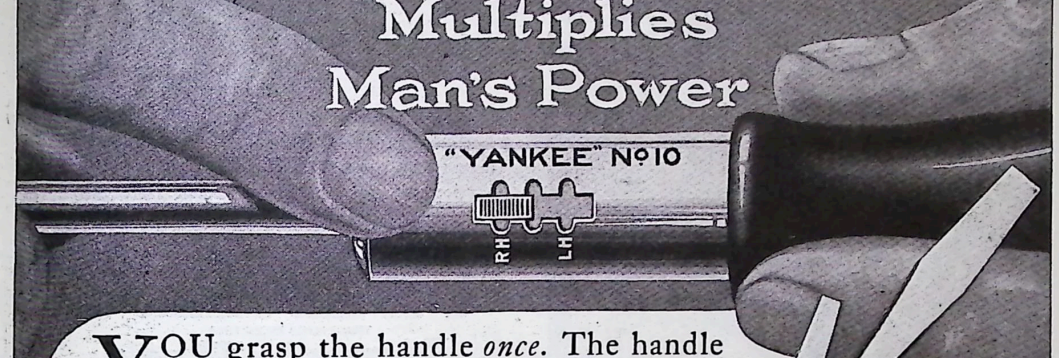
BAILEY BALL THRUST

A frictionless ball bearing to replace thrust washers on Fords and Chevrolet 490's

"YANKEE" Ratchet Multiplies Man's Power



YOU grasp the handle *once*. The handle turns back with your hand—working on a ratchet. No laborious grip-and-let go. Not a moment, motion nor ounce of energy wasted! Telling factors in the work of the speedy tool user!—particularly where many screws are driven.

Shifter gives you Right- or Left-hand Ratchet, for driving or drawing screws; or Rigid Adjustment—at a finger touch. And the "YANKEE" Ratchet is frictionless. Unfailing and long wearing.

"YANKEE" Ratchet Screw-Drivers

Superior in construction. Polished steel blades, won't twist or chip. Hardwood handles. Nickel finish.

	No. 10	No. 15*
2 in. Blade	50c	50c
3 in. "	60c	55c
4 in. "	70c	60c
5 in. "	75c	65c
6 in. "	85c	70c
8 in. "	95c	75c
10 in. "	$1.10	
12 in. "	1.25	

* No. 15, diameter of blade 3-16 in., has handy Knurled Washer for starting wobbly screws with thumb and forefinger while hand steadies driver.
No. 11. Same as No. 10, except Shifter, which moves across, instead of parallel with tool.

"YANKEE" stands for ingenuity. On tools, it's the sign of ingenious features or construction—for saving time and labor; doing more accurate work; operating in ways and places impossible with other tools of like purpose. In short, for Multiplying Man's Power.

"YANKEE" Tools give you a big advantage over the man using ordinary tools.

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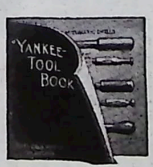

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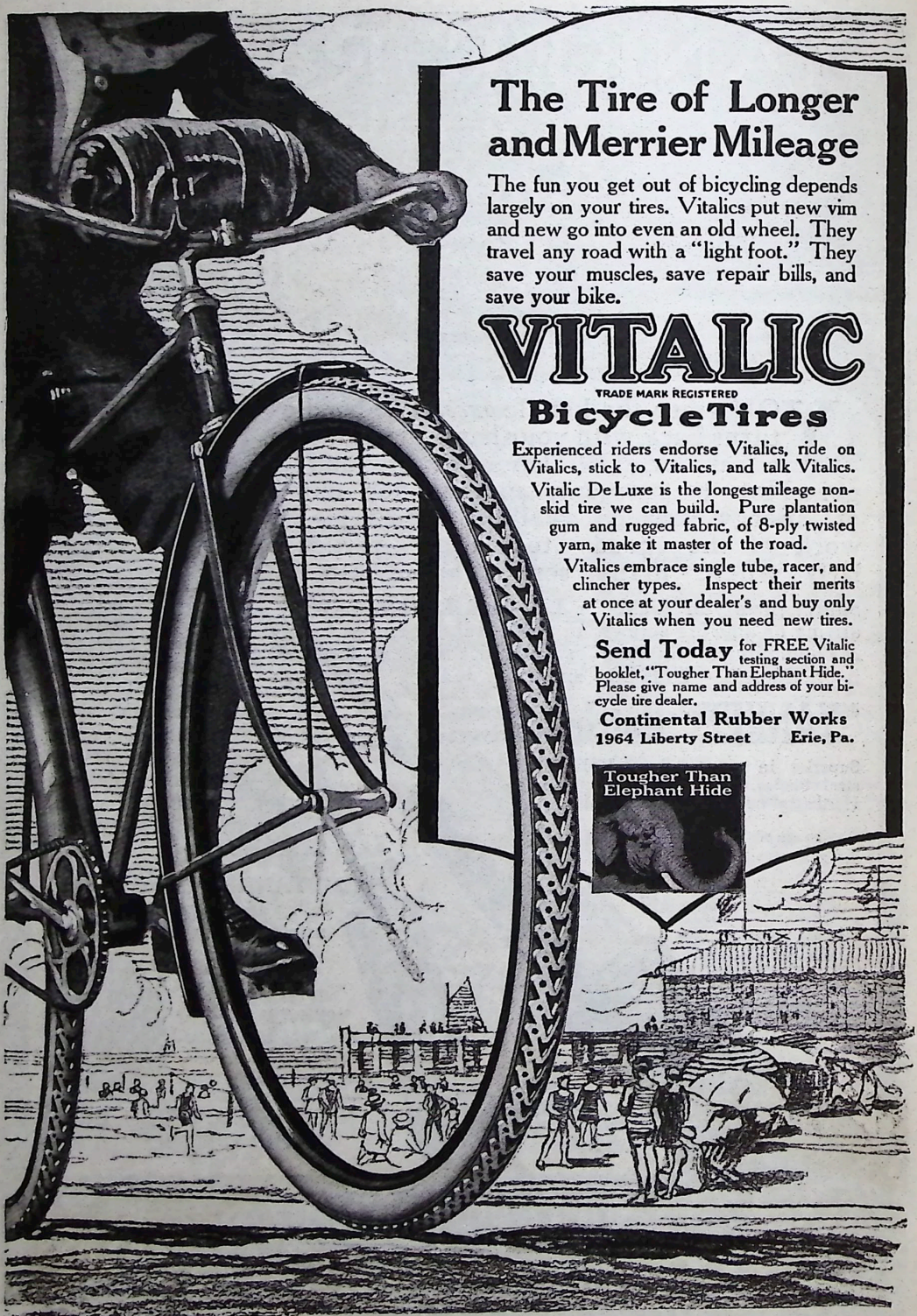

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Please Mention Popular Mechanics

How to build your own rifle range

The famous Winchester Sharpshooter Medal

WHERE to shoot? Is that the problem that has kept you from joining the Winchester Junior Rifle Corps, and your dad from getting you a rifle? If so, tell him that it's easy to rig up a rifle range of your own, where shooting can be made safe. A few practical hints are all you need.

The most important thing is to select a backstop that will catch and hold the bullets. Every shot must be safe.

The side of a hill (as in the picture) makes the best backstop for a range. Dig it out square and face it with light boards to hold your paper targets. If there's no hill available, you can build a backstop in your yard. A large packing case filled with sand or earth will be safe; but any backstop should be at least 4 feet high and 4 feet wide.

If your cellar or basement will give you a clear range of 50 feet, it will make a fine place for shooting all the year 'round, and in all kinds of weather. Here you can make a plain backstop as suggested above, which should not be less than 4 feet square.

The right rifle to use

It doesn't make any difference what kind of model you buy, but it must be *.22 caliber* Winchester. It doesn't make any difference in your shooting whether you get a low-priced single-shot rifle or a fine repeater. The accuracy of a Winchester is in the barrel, and the same quality of steel and the same care in boring goes into all.

Don't delay any longer in joining the Winchester Junior Rifle Corps and in rigging up that range. There is a Winchester Junior Rifle Corps Headquarters in your town. Go to the store, register your name for membership and get the Winchester Junior Rifle Corps button which your membership entitles you to wear. It costs you nothing to join. Your local representative will also supply you with a free copy of the W. J. R. C. handbook.

If you cannot get all the particulars there, write direct to the **Winchester Junior Rifle Corps, National Headquarters, 275 Winchester Avenue, New Haven, Conn., Division 1441.**

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Take-down .22 caliber single shot rifle. A low-priced hammerless, light-weight gun made in two sizes

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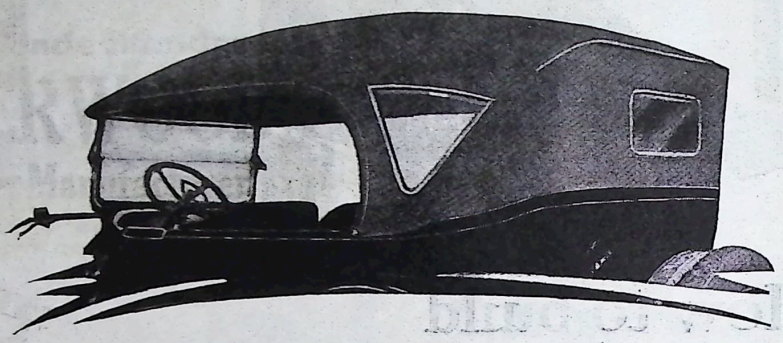

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Columbia Batteries

Dry Batteries

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You'll be mighty grateful to him. Above all, you'll thank him for telling you that it's quite the thing among wise motorists to carry a few extra Columbia cells for just such a pinch.

And you'll make it a rule never again to start out without your own spare set of Columbias tucked away.

These little red packages of sturdy power are easy to buy and use. They'll put life into your engine, auto, or motor truck; into your bells, or telephones.

Fahnestock Spring Binding Posts, no extra charge—if preferred.

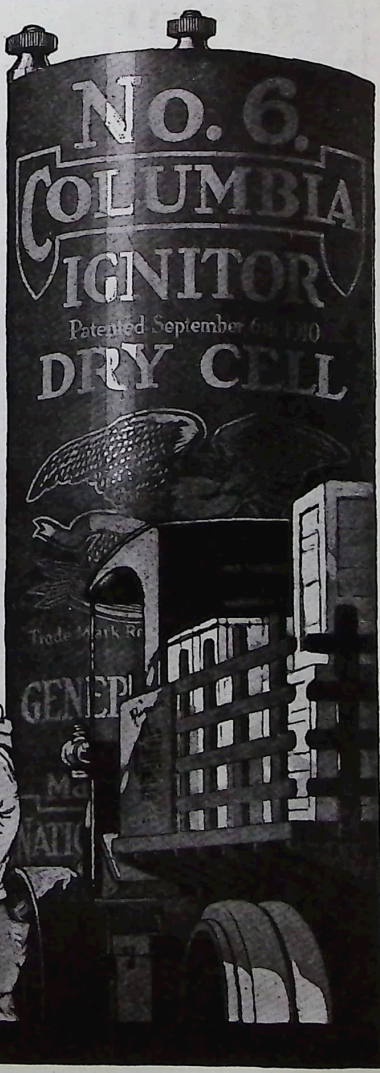
Storage Batteries

The connectors of Columbia Storage Batteries are die-stamped with the *Official Columbia Seal*—persons unauthorized to render Columbia Service dare not remove those connectors.

This seal keeps your battery safe from the prying tools of the incompetent. Only the *Official Columbia Battery Experts shall have access.*

Thus Columbia Storage Batteries are tinkerproof. And they are backed with a guarantee of definite performance; a straight guarantee to give you another battery without payment if the original does not live up to the specifications of the guarantee.

There is a Columbia Service Station or a Service Dealer right near you. Those in charge will be glad to tell you the advantages of Columbia Service.



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CLEVELAND, OHIO

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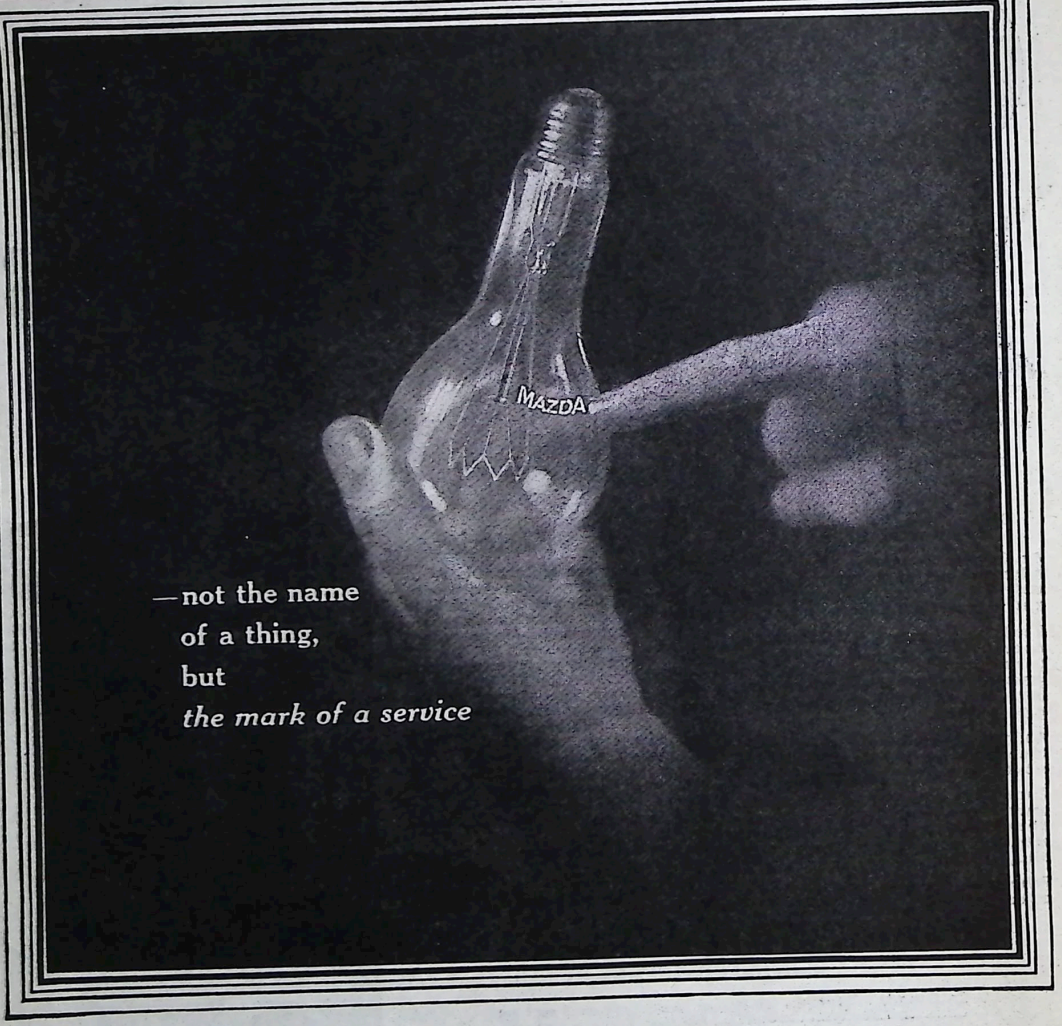
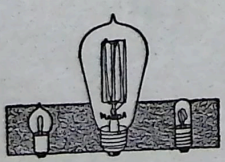


MAZDA

"Not the name of a thing, but the mark of a service"



A MAZDA Lamp for every purpose

MAZDA is the trademark of a world-wide service to certain lamp manufacturers. Its purpose is to collect and select scientific and practical information concerning progress and developments in the art of incandescent lamp manufacturing and to distribute this information to the companies entitled to receive this service.

MAZDA Service is centered in the Research Laboratories of the General Electric Company at Schenectady, New York. The mark MAZDA can appear only on lamps which meet the standards of MAZDA service. It is thus an assurance of quality. This trademark is the property of the General Electric Company.

45-4

RESEARCH LABORATORIES OF GENERAL ELECTRIC COMPANY

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Williams' Shaving Powder

Sift the powder from the hinged-top can

Powder

Just being a powder doesn't get a shaving soap anywhere. It's the quality that counts.

That is where experience in shaving soap making comes in. Williams' Shaving Soap is a Powder, Stick, Cream, or Liquid, as you choose. But what brings men back for more of the form they like is the lather—the abundant, softening, soothing lather. *That* made Williams' Shaving Soap famous long before powder was thought of.

Williams' Shaving Powder gives you a flying start on the shave. But it's the unequalled lather that carries you through and leaves you cheerful and refreshed at the finish.

Williams' Shaving Soap needs no military training. It is ready for service anywhere—the same efficient service it gives at home.

Send 20c. in stamps for trial sizes of the four forms shown here. Or send 6c. in stamps for any one.

The J. B. WILLIAMS CO.
***Dept. A*, Glastonbury, Conn.**

After the shave you will enjoy the comforting touch of Williams' Talc. Send 4c. for a trial size of the Violet, Carnation, English Lilac or Rose.

Our 21 Jewel SMASHES PRICES

Look!

- 21 Ruby and Sapphire Jewels—
- Adjusted to the second—
- Adjusted to temperature—
- Adjusted to isochronism—
- Adjusted to positions—
- 25-year gold strata case—
- Genuine Montgomery Railroad Dial—
- New Ideas in Thin Cases.

Only $2.50 A Month

And all of this for $2.50—only $2.50 per month—a great reduction in watch prices—direct to you—positively the exact prices the wholesale dealer would have to pay. Think of the high-grade, guaranteed watch we offer here at such a remarkable price. And, if you wish, you may pay this price at the rate of $2.50 a month. Indeed, the days of exhorbitant watch prices have passed.

See It First

You don't pay a cent to anybody until you see the watch. You don't buy a Burlington Watch without seeing it. Look at the splendid beauty of the watch itself. Thin model, handsomely shaped—aristocratic in every line. Then look at the works! There you will see the masterpiece of the watch makers' skill. A perfect timepiece adjusted to positions, temperature and isochronism.

Every fighting vessel in the U. S. Navy has the Burlington Watch aboard. Many have over 100 Burlingtons—a few over 200. This includes every torpedo boat—every submarine as well as the big Dreadnaughts.

Burlington Watch Co.
19th Street and Marshall Blvd.
Dept. C119 Chicago, Ill.

Please send me (without obligation and prepaid) your free book on watches with full explanation of your cash or $2.50 a month offer on the Burlington Watch.

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Get the Burlington Watch Book by sending this coupon now. You will know a lot more about watch buying when you read it. You will be able to "steer clear" of the over-priced watches which are no better. Send the coupon today for the watch book and our offer.

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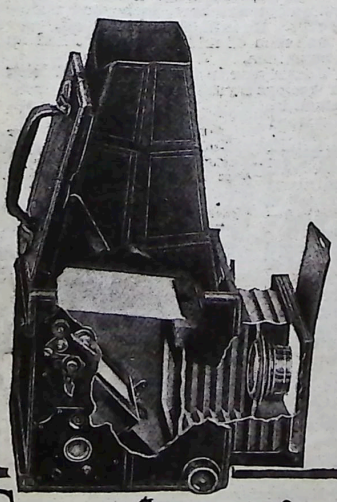
You can get them—with a Graflex

NOT speed pictures alone, but pictures that other cameras can *never* get—good snapshots indoors, or on cloudy or rainy days—the elusive smile of a bashful child, or the shy, furred children of the forest at play—you can get them easily with a Graflex.

The booklet, "Why I Use a Graflex," will prove it, and tell why. Free from your dealer or from us.

FOLMER & SCHWING DEPARTMENT
Eastman Kodak Company
Rochester New York



GRAFLEX Camera

See the picture *before* you snap it

Please Mention Popular Mechanics

Repair Tires Like These

HELP THE NATION SAVE ONE HUNDRED AND FIFTY MILLION

Make from $3000.00 to $5000.00 a year for YOURSELF

$150,000,000.00 worth of tires were prematurely cast aside last year

The old tires illustrated above are actual photographs taken at a Haywood Tire Repair Station. These tires were reconstructed and put again into commission. Each one gave from **3,000 to 5,000 more mileage.** This is a work of real **conservation. There is a great need for more Haywood Tire Repair Stations,** where such work as this—taking old tires like those shown here, making them like new; keeping going tires in condition—can be done.

10,000 to 15,000 Haywood Tire Repair Stations Needed

The $150,000,000.00 worth of automobile tires prematurely cast aside last year could all have been saved, repaired, reconstructed, put again into service and the original investment in them made to yield nearly double. **Think what this saving in tires would mean applied to Liberty Bonds, the Red Cross—the War Chest.** Today when we are saving food, saving fuel, saving every atom of everything that can be saved, even to saving daylight, **this waste in tires must be stopped.**

There was never a more opportune time to open a Haywood Repair Station than at the present. **Automobile tires are advancing in price.** Within the past year the price of tires has increased 42%. In April the government ordered a curtailment of crude rubber of more than half the normal supply. The **automobile owner is facing a tire crisis.** Tires in use right now if properly cared for—taken to a Haywood Station, repaired, reconstructed, put in condition the Haywood way, would solve the problem.

Man alive, start one of these Haywood Tire Repair Stations in your locality. Answer this advertisement.

Oldham who is 59 years old, earned $2,200.00 in 4 months.

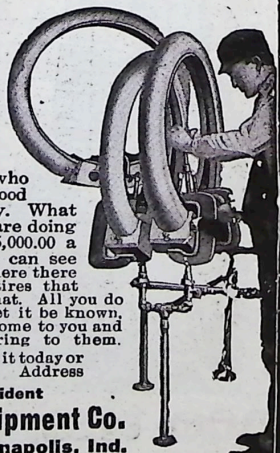
Gibbard, whose photo appears here, is beyond middle age. Read what he says. He is $5,000.00 better off.

This is the first time men of middle age have had an equal chance with young men.

Fredericks says: "Just a year in the business and doing $400.00 to $450.00 per week at a good profit."

No town is too small in which to start a Haywood Station.

I have a big interesting book to send you. A book about tires. It tells all about them. How they are repaired by the Haywood method—explains this business—gives inside figures and profit, gives actual proof of success—Letters of others who are now operating Haywood Stations making big money. What these men have done and are doing you can do. $3,000.00 to $5,000.00 a year is conservative. You can see business around you—Everywhere there are automobiles there are tires that need repairing. You know that. All you do is open a Haywood Station, let it be known, and automobile owners will come to you and welcome the service you bring to them.



Sign the coupon and mail it today or send a postcard or letter. Address

M. HAYWOOD, President

Haywood Tire & Equipment Co.

963 Capitol Ave., Indianapolis, Ind.

I am $5000.00 Better Off Said Gibbard

Fill in and mail this Coupon

It is like the one Gibbard used. It brought him success, justifying the public statement he authorized and which appeared in one of our national ads, as reproduced here

M. HAYWOOD, Pres.

HAYWOOD TIRE & EQUIPMENT CO.
963 Capitol Ave., INDIANAPOLIS, IND.

Dear Sir: Please send me your book on Haywood Tire Repair Plants, and full particulars of your National Tire Repair Service and details of your free school of tire repairing.

Name.....

Address.....

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Want One? Better Hurry!

High-Grade Standard
UNDERWOODS
At 'Way Under Manufacturer's Price

These machines are getting scarce. Big corporations are eagerly buying these perfectly rebuilt Underwoods at present low prices. So, speak quick, if you want one. These are genuine Underwoods—the *Standard* Typewriters. You get Visible Writing Underwoods (guaranteed thoroughly rebuilt), exactly as illustrated, with Back Spacer, Tabulator, Lateral Guide, Stencil Attachment, 2-color Ribbon, Waterproof Cover and Special Touch Typewriting Guide, *at much less than manufacturer's price by acting quick!* One of these superb machines would be of infinite aid to you in your work. With it, you could MAKE EXTRA MONEY IN SPARE TIME doing typewriting for others. You will be surprised how much of this kind of profitable spare-time work you can get once you have a swift, simple Underwood.

U. S. Govt. Has Bought 100,000

Underwoods. Rock Island R. R. just bought 75 of our rebuilt Underwoods. The demand is increasing daily. So our stock is getting low. Present prices cannot be maintained much longer. You better *act quick* if you want one.

How I Double the Life of an Underwood

Do not confuse me with a second-hand dealer. I put each machine through a process that I have spent 25 years perfecting. Each machine is taken apart and rebuilt with necessary new parts, from top to bottom. Expert mechanics re-adjust and re-align each machine. It will stand any mechanical typewriter test. I personally stand back of every machine that goes through my factory with a WRITTEN FIVE-YEAR GUARANTEE OF SERVICE. I guarantee to send you a genuine Underwood, exactly as illustrated and described herewith. You don't even have to buy the machine at the time you get it. You can try it for ten days FREE and then, if you conclude the machine I send you does not look, work and write like new, you may return it and I will refund any deposit or charges paid by you. This guarantee affords you complete protection.

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OR
BUY FOR CASH OR ON EASY PAYMENTS

Guaranteed For 5 Years

Get 10 Days' Trial FREE
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Or—you can RENT it at low monthly rates—or BUY it for cash or on easy payments. If, after renting it 6 months, you want to buy it, I will allow you 6 months' rent, and deduct that from my low price. Do it at once. Another month the price may be dollars more. Write *now* and I will tell you how you can Rent, Buy or Earn an Underwood Free. Ask for Offer No. 52

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Typewriter Emporium
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Typewriter Emporium, 34-36 W. Lake Street, Chicago, Ill.
Send me immediately full facts about your Special Offer No. 52

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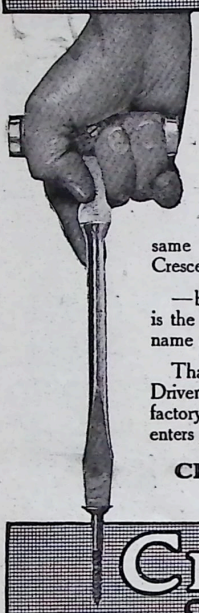

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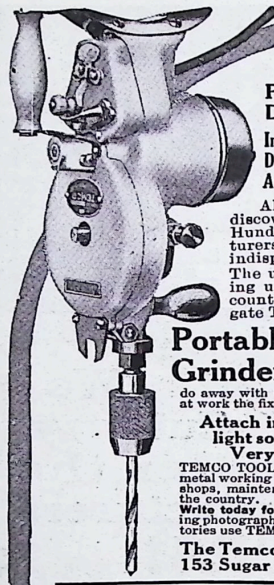
YOU can buy a Crescent Hamr-Handl Screw-Driver with the same confidence that you invest in a Crescent wrench or pair of pliers.

—because, behind every Crescent Tool is the determination to keep the Crescent name a symbol for highest quality in tools.

That is why every Crescent Screw-Driver is 100% tested before it leaves the factory—and 100% guaranteed when it enters your possession.

CRESCENT TOOL CO.
JAMESTOWN, N. Y.

Crescent GUARANTEED Hamr-Handl screw driver



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do away with tiring and slow handwork and get at work the fixed machine tool can't touch.

Attach instantly to any electric light socket, (A. C. or D. C.)
Very low operating cost.

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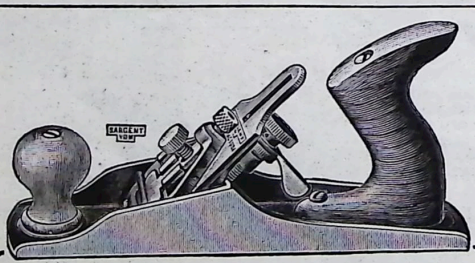

You'll Be Proud of Your New Auto-Set

judging from the enthusiastic letters we have received from proud tool users. They all agree that their *Sargent Automatic-Set Bench Plane* is "The Best Plane Yet Out." Made in six sizes; the superior features to be appreciated by tool users are the automatic set, rigidity, ease of adjustment and the single bit. These Planes are intended for both heavy and very fine cuts. They are especially adapted for working against the grain on cross-grained, hard wood where the absolute rigidity of the cutter avoids any tendency to chatter.

Plane catalogue, with full description of these and other Sargent Planes, sent free on request.

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It's Easy With Our Help

We furnish motors, tone arms, case material, blue prints, full instructions. Plays any record. Make fine profit building them for your friends. Write Today for Free Blue Print Offer. Agents wanted.

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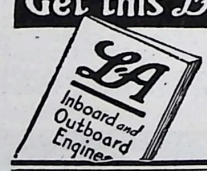
Get this L-A Engine Book



—it gives valuable information about motor boat engines. It also describes the full line of L-A motors and tells of the 30 days' free trial plan. *Write for your copy today.*

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Our Guarantee EHLERT'S Machinists' Tool Cases are strictly high grade, of first class workmanship and material. Are made of select oak as per cut, drawers have solid brass knobs, cover is made of three-ply veneer to prevent warping and is equipped with a 2-keyed cylinder lock. Case is finished in rich golden oak. We guarantee to please or refund all money.

Outside dimensions: length 18 in. and 20 in., height 11½ in., depth 8½ in.

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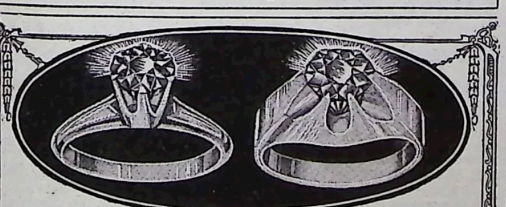

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DON'T send a penny. Just send your name and say, "Send me a Lachnite mounted in a solid gold ring on 10 days' free trial." We will send it prepaid right to your home. When it comes merely deposit $3.75 with the postman and then wear the ring for 10 full days. If you, or if any of your friends can tell it from a diamond, send it back. But if you decide to buy it—send us $2.00 a month until $15.75 has been paid.

Write Today Send your name now. Be sure tell us which of the solid gold rings illustrated above you wish (ladies' or men's)—give us the size of your finger.
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Waterbury
Radiolite
REG. U.S. PAT. OFF.

THIS is the stylish small size watch, a jeweled movement encased in solid nickel.

It is staunchly constructed on the soundest principles of watch making.

Real Radium makes the substance on the hands and figures glow the time in the dark. The luminosity is guaranteed for the life of the watch.

The Waterbury Radiolite sells for $4.50. In a high-grade English pigskin wrist strap it sells for $5.50.

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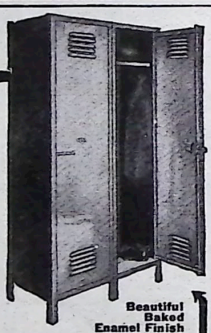

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A most remarkable invention. No electricity, wires or springs. 1918 Improved patented Models. Runs 8 hours for a cent on kerosene. Quiet—Convenient. Brings genuine comfort and satisfaction. Ideal for the sick. A proved success. 4th season. Increase your efficiency. Every home and office should have one. The Wonder Fan. Two Models. Three Sizes. BE WELL. KEEP COOL. Address
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Mostly sold through recommendation. For PERSONAL DESK or GENERAL OFFICE. It checks mental calculations. Buy through your Stationer. Write for 10-day trial offer.
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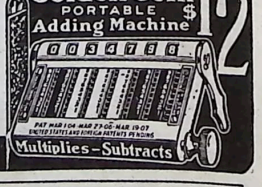
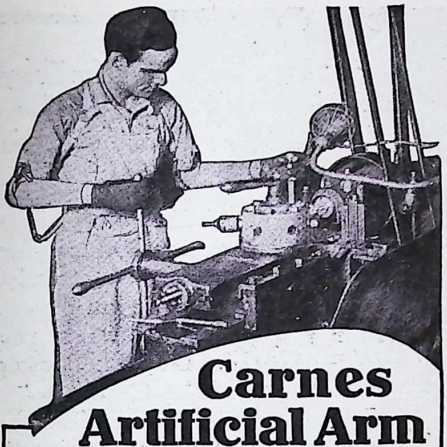


The Pro-phy-lac-tic is the ONE Tooth Brush in universal use today—everywhere



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Endorsed by surgeons everywhere, the Carnes Arm has been declared to be the best substitute ever invented for a natural arm. Is the only arm with full finger motion, hand turning and bending wrist and bending elbow.

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Power from within! Strength that is more than mere muscular strength—the strength of better health, abundant nerve force—the strength of keen reliab. Write and find out what the White Cross Electric Vibrator can do for you. May be operated either on its own dry cells or may be connected with light socket.

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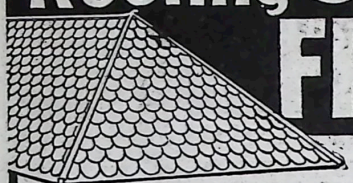

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Edwards "Tightcote" Galvanized Roofing can be bent, twisted or struck by lightning, and the galvanizing will not crack or flake. Bend it or hammer it—you can't loosen or scale the galvanizing. No other galvanized roofing can withstand this test.

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"To take the lead in most respects is some respects is better"

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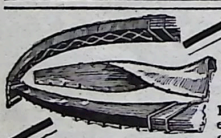

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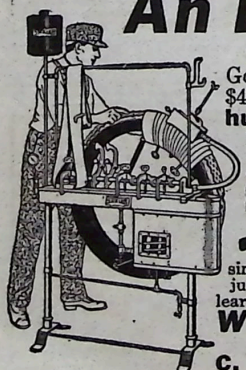

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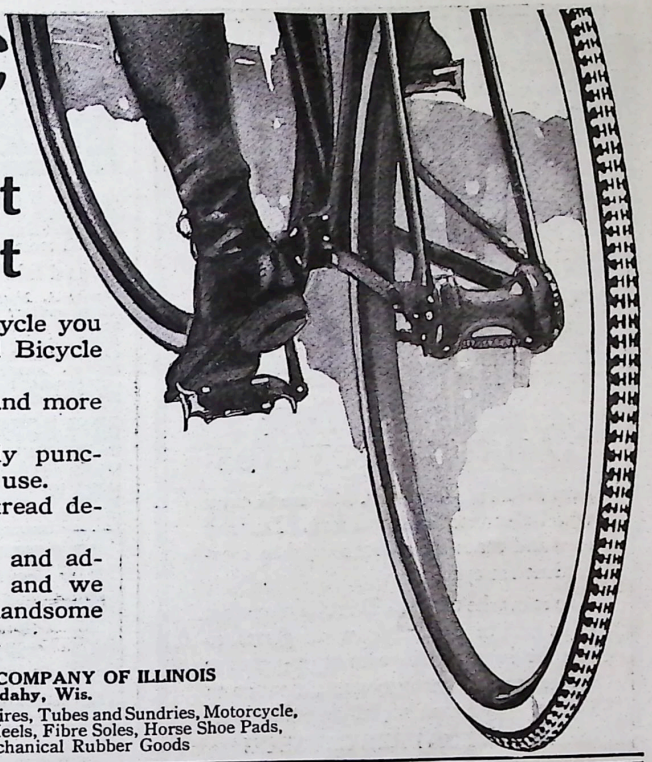

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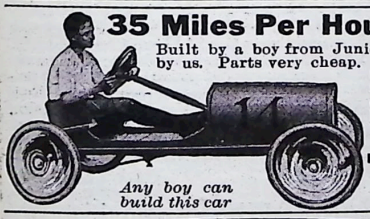

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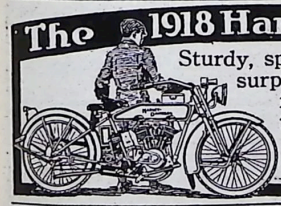

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THE DAYTON sprocket is hobbed, instead of stamped. It is also recessed. These are only details, but it is attention to many such details that *makes* the DAYTON.

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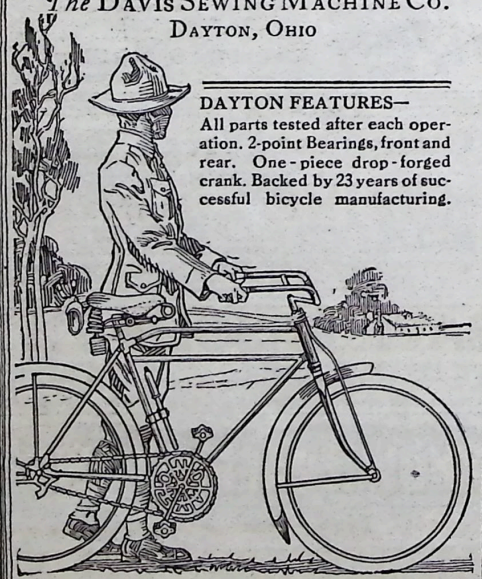

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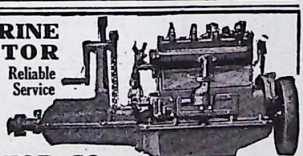

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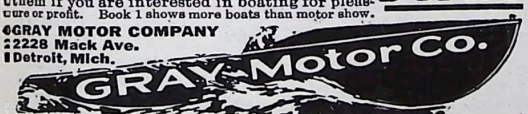

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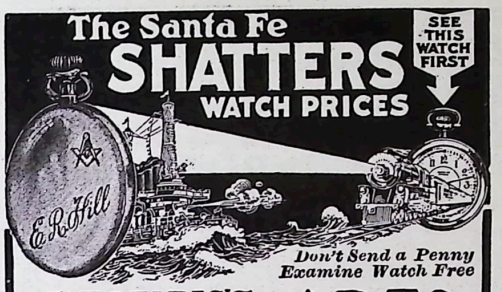

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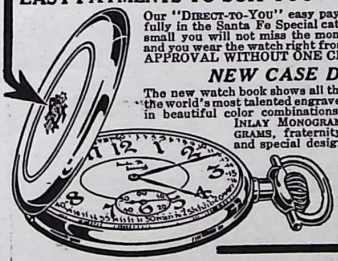

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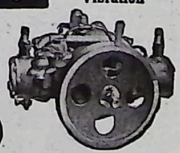

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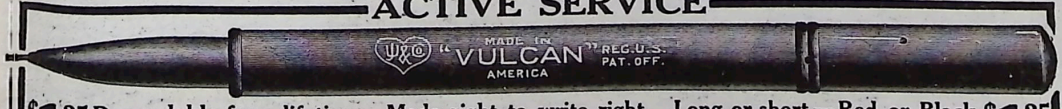

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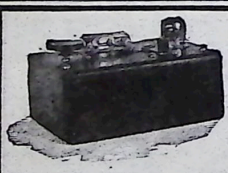

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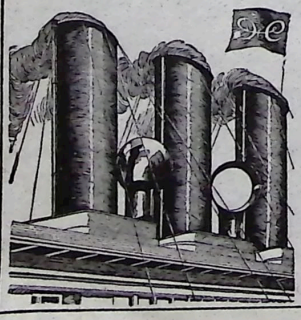

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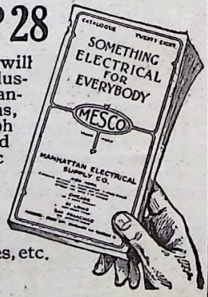

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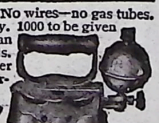

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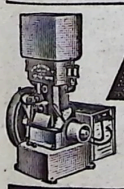

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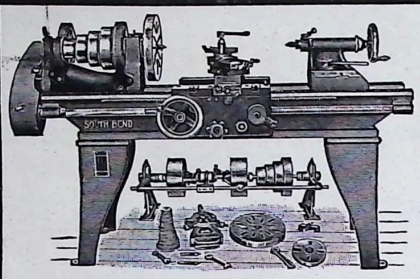

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FOR THE MACHINE AND REPAIR SHOPS

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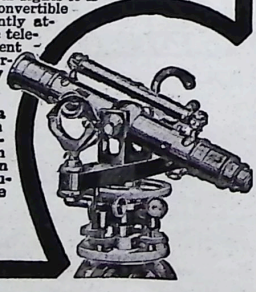

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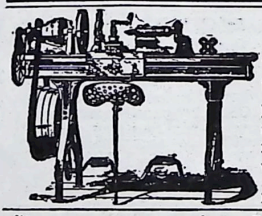

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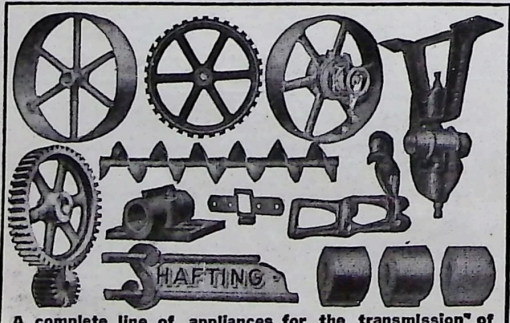

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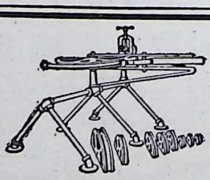

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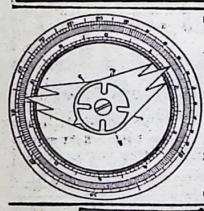

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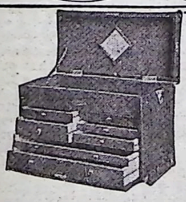

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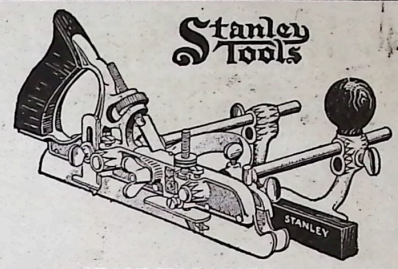

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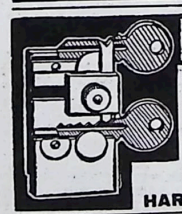

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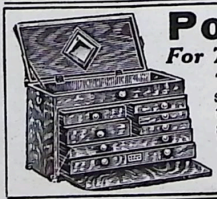

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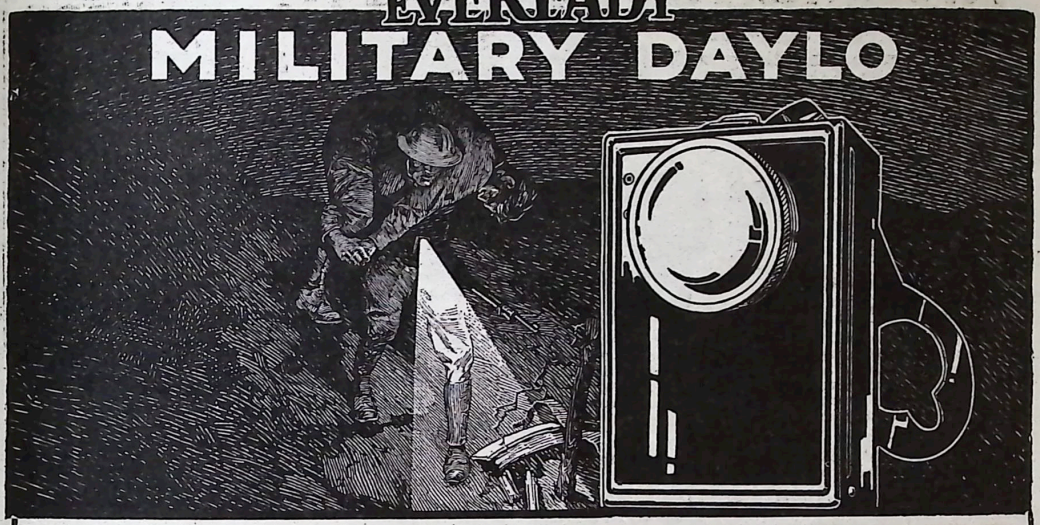

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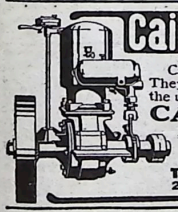

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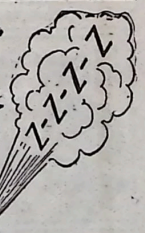

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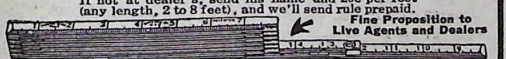

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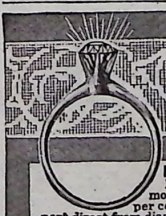

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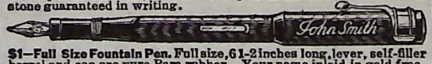

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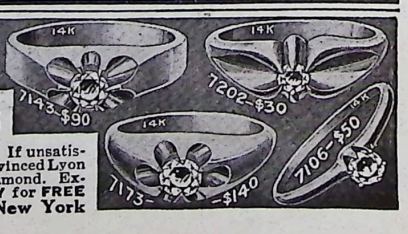

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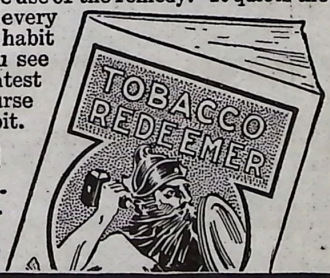

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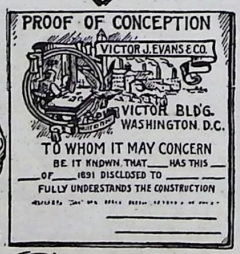

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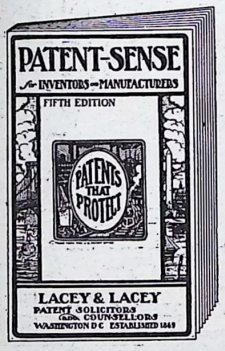

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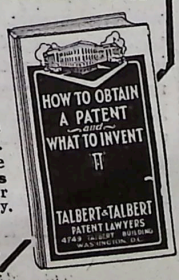

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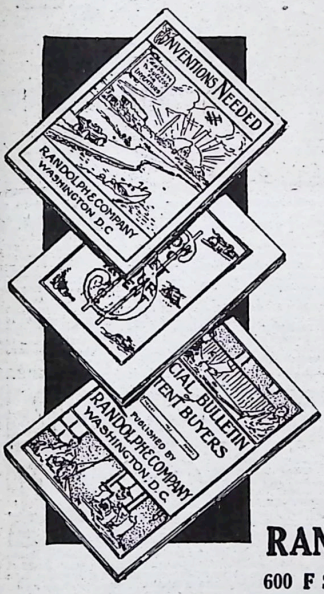

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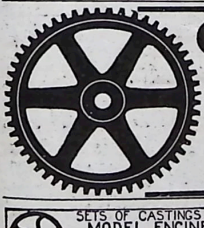

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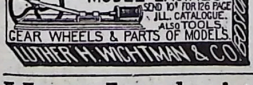

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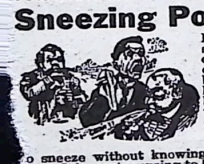

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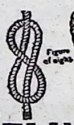

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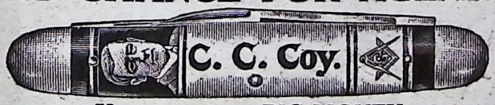

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Make your own Credit Terms—1 to 3 years' time,

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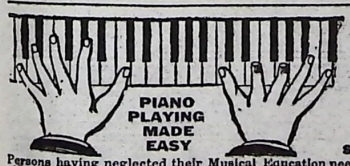

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No Teacher Needed
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Persons having neglected their Musical Education need not despair, for with the aid of our new VAMPING CARD (placing the card upright over the piano keys), you can at once Vamp away to thousands of Songs, Ballads, Waltzes, Rag Time, etc., etc., equal to a Professional Musician. No knowledge of music is required. After using it a few times, you will be able to dispense with the aid of the Vamping Card entirely. **Only 15 cts. p. pd.** Johnson Smith & Co., Dept. 101, 54 W. Lake St., Chicago

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- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting and Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
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- ☐ CIVIL ENGINEER
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- ☐ MINE FOREMAN OR ENGINEER
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- ☐ STATIONARY ENGINEER
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- ☐ Teacher
- ☐ Common School Subjects
- ☐ Mathematics
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
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Fifteen and one-half circulating coils of pipe in the cork-jacketed ice tank insure an ice-cooled sanitary drink to every employee.

The quality of the ice is immaterial, as it does not come into contact with the water. This construction reduces the amount of ice and water required to a minimum.

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The **KOBAN** gives you greater speed because its two cylinders produce more power. In every way, it is the motor for the man who demands real service and efficiency. The **KOBAN does not shake the boat,** because both cylinders fire at the same time, neutralizing the shock.

The Great 2-cylinder

KOBAN
ROWBOAT MOTOR

Only by this 2-cylinder opposed construction can you avoid the vibration that makes riding disagreeable, opens seams and ruins rowboats. Special tilting device for shallow water and beaching. For commercial work the **KOBAN** is unequalled. Used by U. S. Government and in 36 foreign countries.

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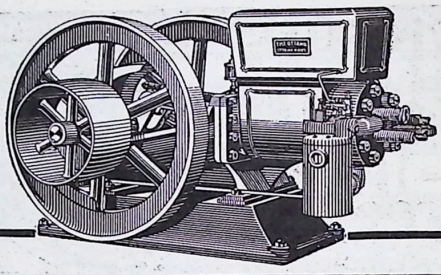

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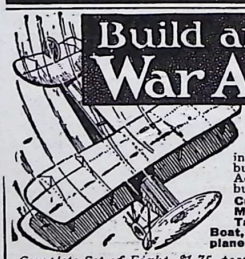

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Sells for $100 less than any other make of equal daily capacity. Liberal contract for fit men. Best states still open.

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Accept no substitute. Order direct from us if dealer will not supply you the genuine *Taylor* Compass.

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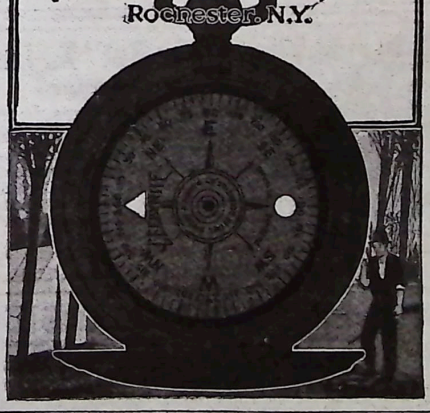

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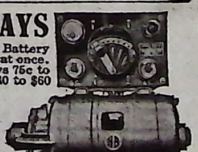

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Balance in 9 monthly payments of $20 each. Earnings should easily pay, with good profit besides. Write for full particulars or send $15 first payment with trial order. Absolute money-back guarantee. No risk.

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GET A Rip Van Winkle Sleeping Bag

At last you can purchase, **almost as cheaply as you could buy an army blanket alone,** a solid comfort sleeping bag which will insure you against cold and sleepless nights. Roll up in a blanket and you wake up a little later cold and shivering "sticking out of the blanket in three or four different places." Crawl into a Rip Van Winkle Sleeping Bag and you sleep warm and "comfy" all night long. Made of warm, strong, mixed wool, olive drab, blanket cloth, with hood, which thoroughly protects the back of your neck, a unique feature of this sleeping bag. A giant safety pin fastens the upper corners snugly under your chin. Made with square corners, to roll up true and compact for your pack-sack. Price only $12, at your dealer's, or direct. Money back unconditionally if not satisfied. Dealers' prices on application. **F. S. CONVERSE & CO., 62 Franklin St., Boston**

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This handsome machine draws the trade—and makes money fast. Every street corner, theater, lobby, picture show, park, amusement resort, etc., right in your own town offers big money-making possibilities. A Bartholomew Pop-Corn and Peanut Machine displays pop-corn and peanuts so temptingly in the sanitary display case that people are impelled to buy. Customers constantly come back for more. You make over 200% profit on every sale.

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FREE TRIAL

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It's the Non-Slipping, yet Non-Rigid Pad and What is Within It That Counts

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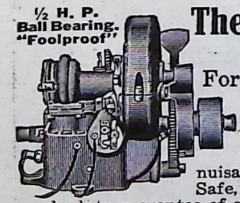

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Gas or Gasoline

For running washing machines, cream separators, fanning mills, fruit graders, grain graders, small lighting plants or any machine ordinarily turned by hand. Cranking nuisance eliminated by foot pedal starter. Safe, reliable, and satisfactory. Sold under an absolute guarantee of satisfaction or money refunded. If your local dealer doesn't handle it, write us for catalogue "A."

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The Thermotub, combined bathtub and water heater. Gives all comforts of modern bathroom. Full length tub. Plenty hot water quick. Write today. *Ask also about our* **Odorless Indoor Closet** *and* **Washstand.** *Make any room complete bathroom.*

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Eliminates the out-door closet and open vault. They are breeding places for germs. Have a warm, sanitary, odorless toilet right in your house. No going out in cold weather. A boon to invalids. Endorsed by State Boards of Health.

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Asthma, Catarrh, and Bronchial Troubles. Obtain O-Zel-O Complete Breathing Outfit without sending one penny and be free from these distressing ailments. Protect your health. Make money advertising this outfit among sufferers everywhere. It prevents irritation of delicate membranes of nose, throat, and lungs and affords immunity from germ-laden Dust, Pollens, Noxious Smoke, and Fumes. NO CANVASSING. NO MONEY NECESSARY.

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☐ Electric Wiring	☐ Window Trimmer
☐ Telegraph Engineer	☐ Show Card Writer
☐ Telephone Work	☐ Sign Painter
☐ MECHANICAL ENGINEER	☐ Railroad Trainman
☐ Mechanical Draftsman	☐ ILLUSTRATING
☐ Machine Shop Practice	☐ Cartooning
☐ Gas Engine Operating	☐ BOOKKEEPER
☐ CIVIL ENGINEER	☐ Stenographer and Typist
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☐ Ship Draftsman	☐ Teacher
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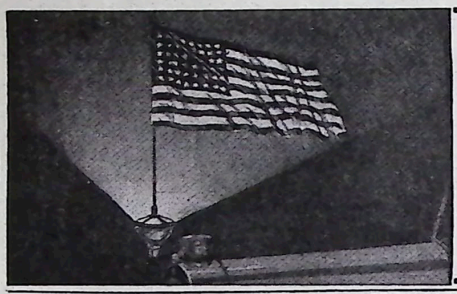

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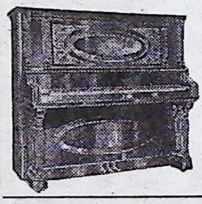

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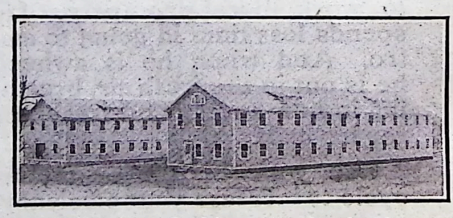

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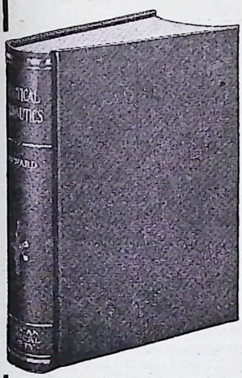

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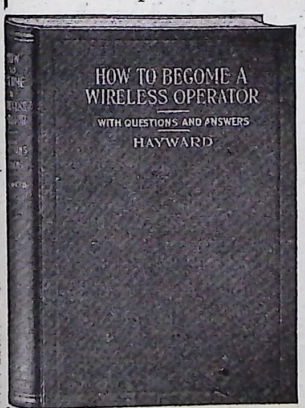

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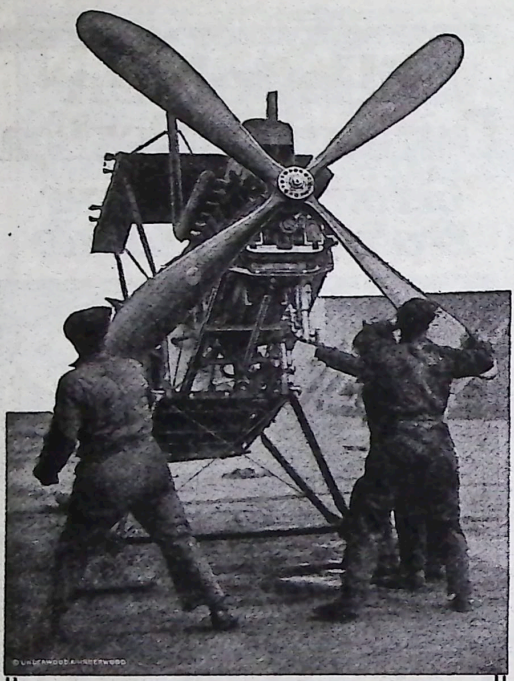

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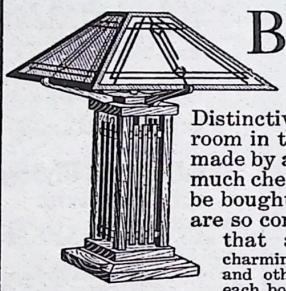

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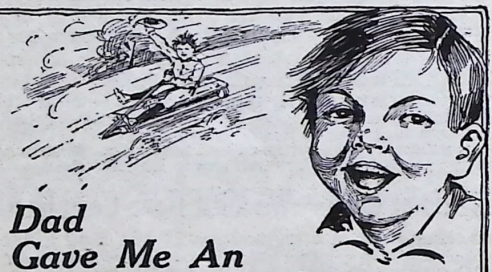

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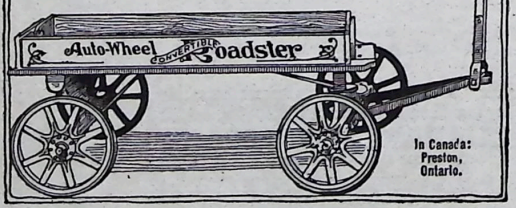

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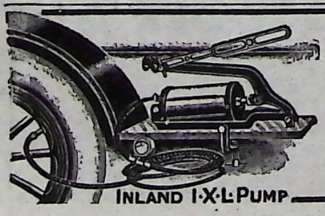

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KOR-KER is a compound boxed in powder form. Mixed with water, is readily installed through valve stem. **KOR-KER is forced into the puncture by the air pressure, compressed into a cement plug and becomes an integral part of the tube.** Same action occurs in sealing slow leaks.

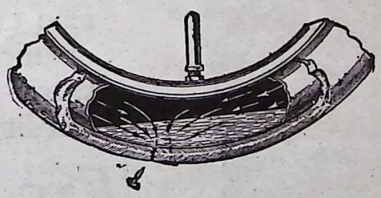


Diagram showing the action of Kor-Ker

KLEAR-SIGHT Windshield Cleaner and ALCOLA Non-Freeze Solution, the best alcohol substitute, are two other of our products.

Mail This Today
Send me details regarding your proposition.
Name.....
Address.....

ALCEMO MFG. CO., 7 Bridge St., Newark, N.J.

Let Us Be Your Factory

Having moved into our new building, a modern manufacturing plant, with ample switch track and assembly facilities, we are open for engagement on machinery parts or quantity production work.

Capacity consists, in part, of Engine Lathes, Drill Presses, Potter & Johnson Automatics, Turret Lathes with Air Chuck equipment, etc.

Tool room equipment equal to demands of production departments.

DONALDSON & FISHER MFG. CO.
1654 Besley Court **CHICAGO**

When You Build

please bear in mind that there is still plenty of

WHITE PINE

Send for our free booklet, "WHITE PINE IN HOME-BUILDING"

WHITE PINE BUREAU
1626 Merchants' Bank Bldg. **ST. PAUL, MINN.**

LEARN TO MAKE MODELS

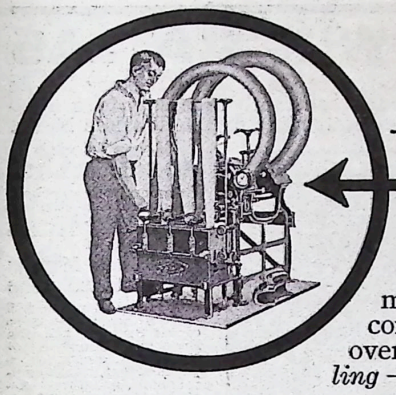
If You Have Artistic or Constructive Ability

You can make models like these. A quick, inexpensive and effective method of modeling to scale; showing how Buildings will appear upon Completion. An interesting hobby and a money-maker. Learned in six lessons. Write **E. FOWLER, 1832 Franklin St., SAN FRANCISCO, CALIF.**

Always Dependable, Champions are now Super-Dependable. Insist on Champion for your motor—see that Champion is on the Porcelain as well as on the box.

Champion Spark Plug Company, Toledo, Ohio

Please Mention Popular Mechanics



This Machine will give you Your Start

NOW IS THE TIME to establish yourself in the profitable and growing business of Tire Repairing. Tire prices are rising; millions of cars are in use and millions more are coming; all have tires and tubes to mend over and over again. The demand for tire repairing is *doubling* —and there is a shortage of men to do the work.

Big Profits from the start for Men of All Ages

It is easy for men of almost any age or previous occupation to make good;—the work comes quickly and is easily done;—you can start on small capital in a small space and add equipment as your business grows;—lots of repairing is to be had everywhere and at a good margin of profit;—all provided you have the **right training** and the **most approved** equipment. **We furnish both.**

Akron-Williams

TIRE REPAIR EQUIPMENT

Designed and Perfected by the Foremost Tire Engineers. Used, Sold and Recommended by All Leading Tire Companies

Over 100 Tire Factories use Akron-Williams outfits and recommend and sell them to their Dealers all over the world. **Think what that means!** Could there be any stronger endorsement of their efficiency and money-making features?

We offer you the same Akron-Williams outfits, each one designed and perfected with the help of expert engineers in these big tire factories. There's an outfit for every size shop, and a machine or tool for every purpose.

Learn Under the Best Experts, Get Choice of Best Locations

For buyers of Akron-Williams outfits we arrange thorough and practical training in all branches of tire and tube repairing, under the personal direction of experts in the big tire factories.

Furthermore, we are constantly in touch with the best openings available all over the country and we help buyers of our equipment to locate where opportunities are Best.

Start Right—with Akron-Williams, the most approved equipment. WRITE TODAY for full information.

The Williams Foundry & Machine Company
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THE WILLIAMS FOUNDRY & MACHINE CO.
Cherry Street, AKRON, OHIO

You may send me catalog, prices, and full information regarding your tire repair equipment.

Name.....

Street.....

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Your Own Tire Repair Shop.

Please Mention Popular Mechanics

Use Kerosene

Drive Your Ford Twice as Far and Buy Your Fuel for Less Than Half

SAVE 60% MILEAGE COST

OFFICIAL TEST

Detroit Automobile Club

JUNE 4, 1918

UNDER instruction of Mr. W. S. Gilbreath, manager of the Club, I acted as observer of a test run made with your Kerosene Equipment on June 3rd.

The equipment in question was attached to a 1914 Model T Ford, which was not in the best mechanical condition at the time.

One and one-fourth gallons of Kerosene were consumed in the test, a distance of 37 7-10 miles being traversed, much of this on ordinary country roads. About eighteen miles of the trip was through fairly heavy traffic. A speed of 22 miles per hour was maintained.

Performance of the car was equal to, if not better than could have been done on other types of fuel.

DETROIT AUTOMOBILE CLUB,
E. W. SULLIVAN, Observer

Buy Now

Order direct from this advertisement. Enclose purchase price, $25 for complete Equipment on 30 days' trial.

If you find it doesn't do all that you expect—if you think it isn't an **immense money saver**—return it within a month from date shipped, and get your money back. No risk. Send order today on

Absolute Guarantee

30 DAYS' TRIAL OR MONEY BACK

A USER SAYS: "We have certainly gotten some positively wonderful results out of this carburetor and would not go back to straight gas on a bet."

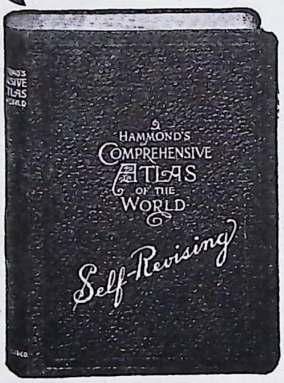
"THE HUNTLEY,"
Winona, Minn., May 23, 1918

Free Descriptive Circular for the Asking. Some Sales Territory Still Open

Kerosene Equipment Co.
396 Kresge Building, DETROIT

NOW YOU NEED A GOOD ATLAS

Never before in the World's History has an atlas been so constantly necessary to an intelligent understanding of the World's News.



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Steel Fishing Rods

and MEEK & BLUE GRASS REELS

Build up your health to stand the war strain. It is important that you "save" your health in order that you may "pay" with double your usual amount of work. Week end fishing trips with your "Bristol's" and MEEKS will keep you "fit" and make you able to work harder Monday morning.

Two Catalogues Free

showing all "Bristol" rods and Meek reels, send for them today. If your dealer cannot supply you, order your rods and reels from us at catalogue prices.

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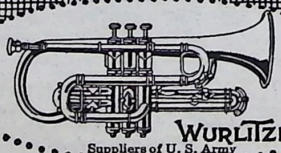

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Suppliers of U. S. Army

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THIS superb, triple silver-plated Lyric cornet sent you on free trial. Play it a week before you decide. Prove for yourself in your own home its tone and playing quality.

Terms Easy Handsome carrying case included free with special offer. You can pay in small monthly sums.

WRITE TODAY for our big, 176-page book of all musical instruments. Sold direct from maker at the rock-bottom price. Write today.

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Mathematics Made Easy by ROPP'S CALCULATOR

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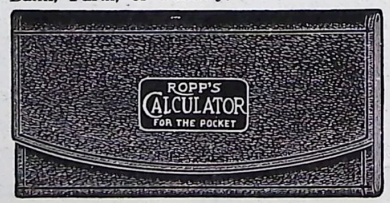

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BEST IN THE LONG RUN!

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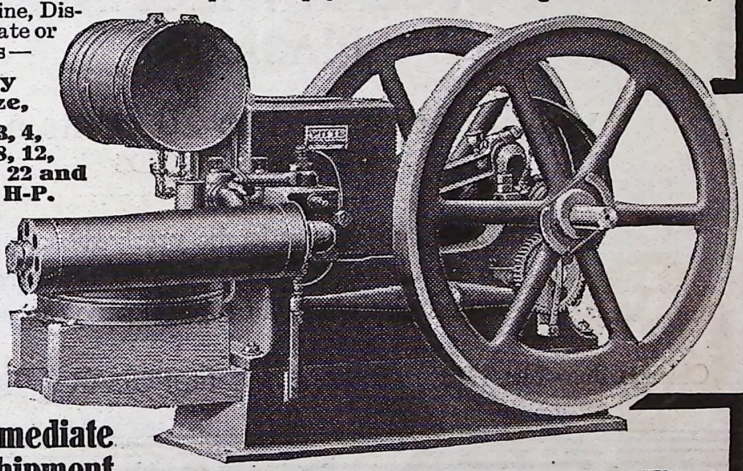
On My New 90-Day Engine Offer

I have NOW made it possible for every man to own a High-Grade Witte Engine on practically his own terms, saving $15 to $200—enough to buy fuel to earn its first cost. Write me at once for this new offer. Take your choice of four plans of payment—choice of engines—Kerosene, Gasoline, Distillate or Gas—

Any Size, 2, 3, 4, 6, 8, 12, 16, 22 and 30 H-P.



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You can have a Stationary Engine, a Portable, or a complete Saw-Rig ready to use. Let me show how easy it is to own a high-grade engine at a big saving by writing your own order.
ED. H. WITTE.

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If I did not own and operate the largest exclusive, direct-selling engine factory in the world, I could not make you this offer on such favorable terms. **You may need an engine** for pumping, feed cutting, silo filling, wood-sawing, threshing, operating cane mill, fanning mill, corn meal mill, saw mill, shingle mill, shop machinery, spraying, running cream separator, grindstone, washing maching, etc. **A good** engine is the only labor saving farm machine that you can run every day in the year, winter or summer, and make money. You can use it for yourself or for others, make it take the place of high-priced help, do the work quicker, better and cheaper. My engines are giving satisfaction to thousands. They have big surplus power, take the least amount of fuel, are easy to operate and understand — Cost less.

Try a WITTE Engine First

PUT IT TO WORK—satisfy yourself that I offer the biggest engine value on the market, give you the best service, the most favorable terms, the best price, and ship your engine when you want it—all complete, ready for business. Don't forget that I make nothing but engines—rely on no other source of revenue to keep business going. **I have to make good,** and I have been making good **for over 32 years.** The secret of my success is an honest engine, well made, fairly priced and delivered PROMPTLY. When I tell you that I can sell you a better engine and save you money, I mean just what I say. Don't buy any engine until you get my latest offer and liberal terms of payment.

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Let me send you the proof — my new copyrighted engine book—**"How to Judge Engines."** It's the original How-to-Judge-an-Engine Book — shows you the difference in engines—tells you how to properly judge engines. It's jam full of engine pictures—tells you the things you want to know, explained in a way you can understand. **Write for this book today**—read it before you buy any engine at any price.—ED. H. WITTE, President.

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ANNOUNCEMENT

With the September issue the price of

POPULAR MECHANICS MAGAZINE

will be advanced to 20 cents a copy
AT NEWS STANDS

On and after August 1st the yearly subscription in the United States and to its possessions and Canada will be $2.00 per year

Chicago, June 21st, 1918 — POPULAR MECHANICS CO.

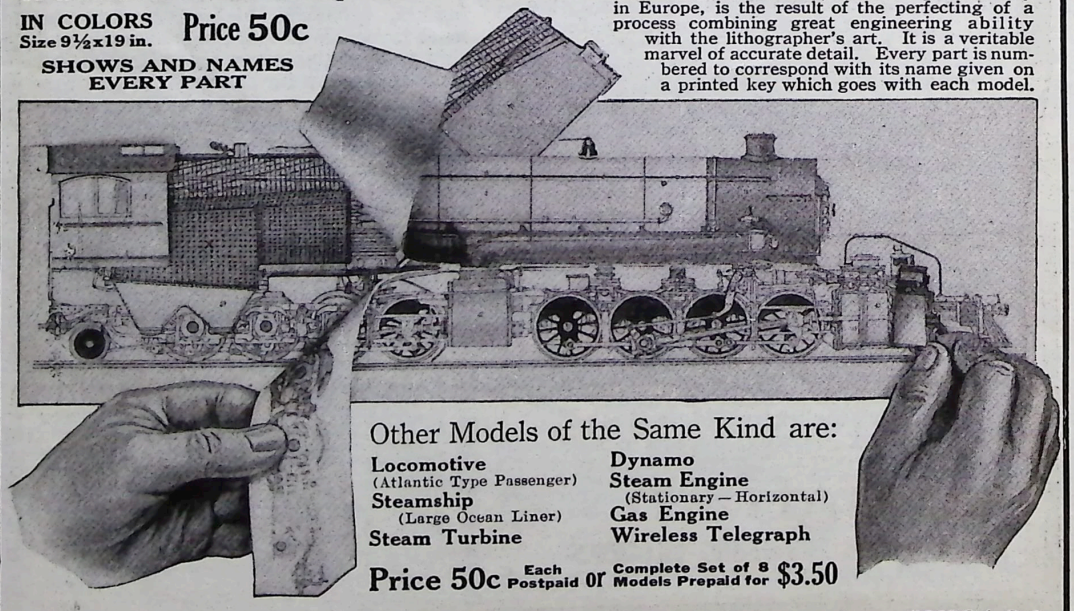
New Lithographic Model

of a Monster Mallet Compound Locomotive

IN COLORS Size 9½x19 in. **Price 50c**

SHOWS AND NAMES EVERY PART

As shown by the photograph, this is a dissected chart, which by an ingenious series of folds or flaps and a careful use of colors, clearly depicts every part of this giant of the rails. This educational contrivance, made at present only in Europe, is the result of the perfecting of a process combining great engineering ability with the lithographer's art. It is a veritable marvel of accurate detail. Every part is numbered to correspond with its name given on a printed key which goes with each model.



Other Models of the Same Kind are:

Locomotive (Atlantic Type Passenger)
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Ignatius Barnard

BARGAINS IN FINE QUALITY DIAMONDS

This popular man's mounting can be furnished with any diamond shown below at an extra charge of $3.00

I have Protected you against Double Prices on Diamonds

Months ago, before the cutters doubled their prices, I imported a vast stock of fine diamonds, which I offer direct to you at 35% to 50% below what others must ask today. I sell thousands of fashionable 14 Karat solid gold mountings at **actual factory cost.** Send for my free Diamond book, or let me send you any bargain here shown for Free Examination—learn why Barnard is known for lowest prices on diamonds all over the world!

1/8 Carat

Wesselton Blue White, very brilliant diamond, in hand made, hand carved, ladies' setting.

$10 Retail value, $18 to $20.

1/4 less 1/32 Carat

Steel Blue White, Engagement quality diamond, very finest cutting and brilliancy, in 14K solid gold, hand made, carved mounting, Retail val. $40.

$24.88

1/3 Carat

Blue Wesselton, first quality diamond, very finest cutting and brilliancy, in 14K engagement style high prong mounting. Retail value $75.

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3/8 Carat

Liberty Bond Special. Wesselton Blue White diamond, our Commercial grade, very finest cutting and brilliancy, very slightly imperfect. 14K solid gold Engagement high prong mounting. Retail value $81.00. Will accept a $50 Liberty Bond of any issue, as $51 in cash for this ring.

$51

Send No Money!

I ship any diamond you would like to see for free examination—to any bank or express office—you are not obligated to buy.

Bankable Money-Back Guarantee

issued with every diamond—a legal contract to refund the purchase price less 10% within one year, and permits exchange at full value at any time. Legally certifies the carat weight, quality and value you receive.

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$102

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Not merely a catalog—but an illustrated authority on diamond facts that tells you in simple language, all you've wanted to know about diamonds. Shows the latest ideas in fashionable solid gold mountings for men and women, such as Ear Screws, solitaire rings, fancy rings, scarf pins, studs, brooches, lace pins, princess rings, LaVallieres, etc., etc. A bound book of great value you'll be glad to own. Absolutely free. Write for your copy now.

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Wesselton Steel Blue white diamond of our Engagement quality, exceedingly fine in cutting and brilliancy, quality fine enough for an Engagement solitaire. Mounted in 14K solid gold high prong engagement style mounting. Retail value $140.00.

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A Quick and Permanent Repair for Tubes and Casings

JOHNSON'S HASTEE PATCH is a quick and permanent repair for tubes, casings and rubber goods of all kinds. No time, labor or heat required. An ordinary sized patch can be applied in two minutes—and it's so simple that a child can use it. Johnson's Hastee Patch is much more satisfactory than vulcanizing because there is no danger of burning or spoiling the tube.

JOHNSON'S HASTEE PATCH

If you'll carry a box of Johnson's Hastee Patch in your tool kit you can eliminate the expense of a lot of spare tubes and casings which fast deteriorate during the hot motoring months. A box of Johnson's Hastee Patch in your car answers the same purpose as two or three extra tubes and casings. And there is a saving of 23c over garage vulcanizing on your smallest patch and much more on large ones.

Johnson's Hastee Patch gives equally good results on a pin hole puncture or on a large blow out. It is conveniently put up in strips so the user can cut the right size patch for each particular break. It takes but two or three minutes to perform the entire operation and the tube can be pumped up immediately and is ready for instant use at any speed.

Use coupon for a 50c box which will make 25 average patches.
We guarantee satisfaction or money back.

S. C. JOHNSON & SON, Dept. PM 8, Racine, Wis.

I enclose 50c for which please send me by prepaid parcel post a 50c box of Johnson's Hastee Patch which I understand contains a strip from which 25 ordinary size patches may be cut. Also send me booklet entitled "Keep Your Car Young."

Name .....

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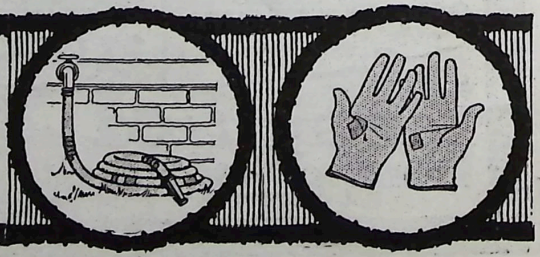

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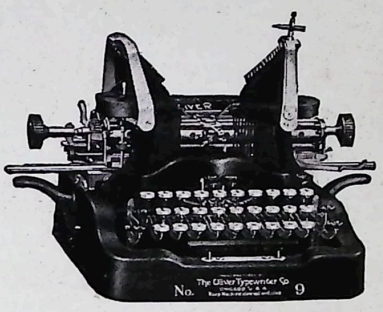
Keep It
for $3.00 per Month



Or Return It At Our Expense

The Oliver Typewriter—Was $100—Now $49

A $2,000,000 Guarantee that it is the Identical Model

Be your own salesman and earn $51. It used to be that 15,000 salesmen and agents, office rents in 50 cities and other expenses demanded 50 per cent of the price. But all that is ended. You get the identical typewriter formerly priced $100—not a cent's alteration in value. The finest, the most expensive, the latest Oliver Model. Old methods were wasteful. Our new plan is way in advance. It is in keeping with new economic tendencies. It does away with waste. Inflated prices are doomed forever.

Brand New—Never Used

Do not confuse this with offers of earlier models, or second-hand. Note the signature of this advertisement. This is a $2,000,000 concern.

We offer new Olivers at half price because we have put typewriter selling on an efficient, scientific basis.

You now deal direct—sell to yourself, with no one to influence you. This puts the Oliver on a merit test. No middle men—no useless tolls.

The entire facilities of the factory are devoted exclusively to the production and distribution of Oliver Typewriters.

You Save $51

This is the first time in history that a new standard $100 typewriter has been offered for $49. Remember, we do not offer a substitute model, cheaper nor different. But the same splendid Oliver used by the big concerns. Over 600,000 Olivers have been sold.

We ship direct from the factory to you. No money down—no red tape. Try the Oliver Nine at our expense. If you decide to keep it, send us $3.00 per month. If you return it, we even refund the shipping charges. You are not placed under the slightest obligation. That's our whole plan. We rely on your judgment. We know you don't want to pay double. And who wants a lesser typewriter? You may have an Oliver for free trial by checking the coupon below. Or you may ask for further information.

An Amazing Book

All the secrets of the typewriter world are revealed in our startling book entitled "The High Cost of Typewriters—The Reason and the Remedy"—sent free if you mail the coupon now. Also our catalog. Order your free trial Oliver—or ask for further information at once. Canadian Price, $62.65.

THE OLIVER TYPEWRITER CO.
109B Oliver Typewriter Bldg., Chicago

NOTE CAREFULLY—This coupon will bring you either the Oliver Nine for free trial or further information. Check carefully which you wish.

Mail This Coupon Now!

THE OLIVER TYPEWRITER CO.
109B Oliver Typewriter Bldg., Chicago, Ill.

☐ Ship me a new Oliver Nine for five days' free inspection. If I keep it, I will pay $49 at the rate of $3 per month. The title to remain in you until fully paid for.

My shipping point is.....

This does not place me under any obligation to buy. If I choose to return the Oliver, I will ship it back at your expense at the end of five days.

☐ Do not send a machine until I order it. Mail me your book—"The High Cost of Typewriters—The Reason and the Remedy," your de luxe catalogs and further information.

Name .....

Street Address.....

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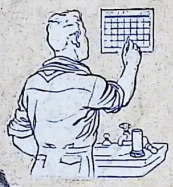
Scientific Laboratory Tests

proved that there are 378 shaves in each "Handy Grip" Shaving Stick. They showed that .15 grams of the soap makes a thoroughly satisfactory lather—a shave a day for over a year in the 56.7 grams in the "Handy Grip" Stick.



Practical Home Tests

showed an average of 338 shaves from each "Handy Grip"—a little less than the ideal laboratory tests, as was to be expected. All kinds of shavers made these tests—wasteful, thrifty, and in-between—using an average of .16+ grams per shave.

COLGATE'S

"HANDY GRIP"

PATENTED 1917

Saves 50 Shaves—the Soap Unscrews

This shaving stick is thrifty. The "Handy Grip" lets you use *all* the soap—you can *unscrew* the last half-inch and stick it on a new stick—no waste. As illustrated below, you save 50 shaves —50 cool, comfortable Colgate shaves.

The stick is the most economical form of shaving soap. We make Shaving Powder and Cream as well as Sticks—so we can advise you impartially that you get twice as many shaves from a stick as from a cream—Colgate's Cream or any other.

COLGATE & CO.

Established 1806

New York

Unscrew the last half-inch from the Grip—using knife-blade.

Stick the stub on a "Refill" Stick—it stays there—thus all the soap is used